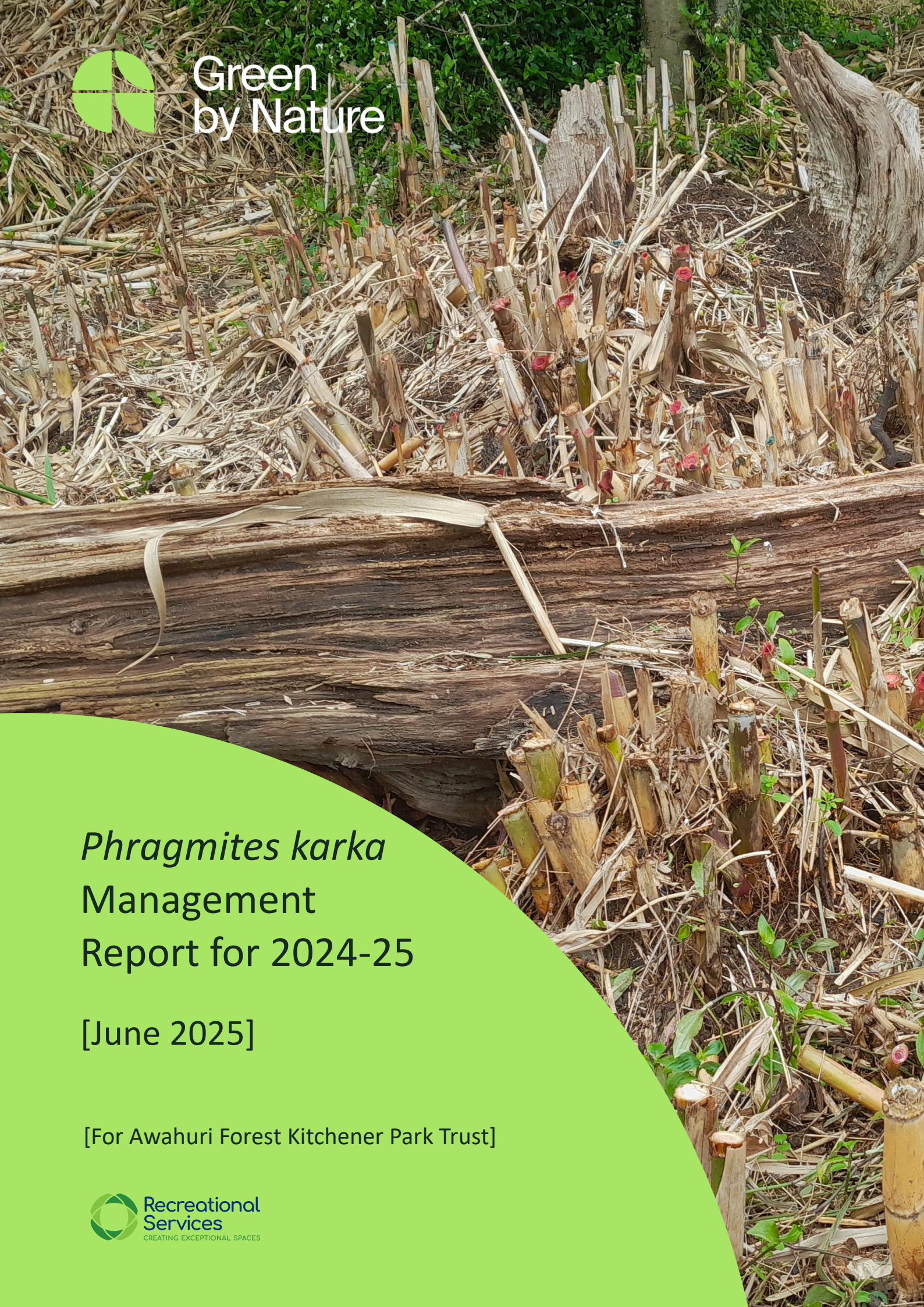

Green by Nature

Phragmites karka Management Report for 2024-25

[June 2025]

[For Awahuri Forest Kitchener Park Trust]

Recreational Services
CREATING EXCEPTIONAL SPACES

This report was prepared by:

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Green by Nature

For:

Awahuri Forest Kitchener Park Trust

INTRODUCTION

The Awahuri Forest Kitchener Park Trust (AFKP Trust) received funding from Horizons Regional Council's Kanorau Koiora Taketake – Biodiversity Community Grant for management of *Phragmites karka*.

Previous funding – July 2022 to June 2024 – covered work to find and publicise effective management techniques for *Phragmites karka* including:

- Validating and continuing the initial small plot research and development carried out by Recreational Services[1] for the AFKP Trust to find ways of managing *Phragmites karka* within AFKP.
- Taking the more successful small plot trial methodologies and scaling up these trials across AFKP and the Makino Stream to assess the effectiveness, practicality, and costs of *Phragmites karka* management across the whole region in streams, rivers, estuaries, and other sensitive infested areas.

The 2024-25 funding was given with the proviso that it was for management of *Phragmites karka* only as the research and development phase was complete. While the Trust and Green by Nature believe that research and development is far from complete, the Kanorau Koiora Taketake (KKT) funding was restricted to management activities.

All research-related activities undertaken this year have been funded by the Trust, over and above the KKT funding. Observations and knowledge gained from the Trust-funded activities have also been shared in this report, with approval from the Contract Manager.

Also included in the report are observations and knowledge gained from the *Phragmites karka* control work undertaken on the Makino Stream for Horizons Regional Council's River Management team.

Bessie Nicholls, AFKP Trust Chair, was the Contract Manager and the AFKP Trust contracted Green by Nature to manage the delivery. I was responsible for day-to-day management of the project and supervision of the other labour. Labour was provided by Ngā Kaitiaki o Ngāti Kauwhata's Mana Taiao team.

[1] Since October 2023, Recreational Services has been trading as Green by Nature.

CONTROL WORK

Cut and Inject Method

A treatment method developed in the previous financial year, which consists of cutting the stem just above a node and injecting the herbicide solution into the hollow stem through the node. Equipment used is pictured below.

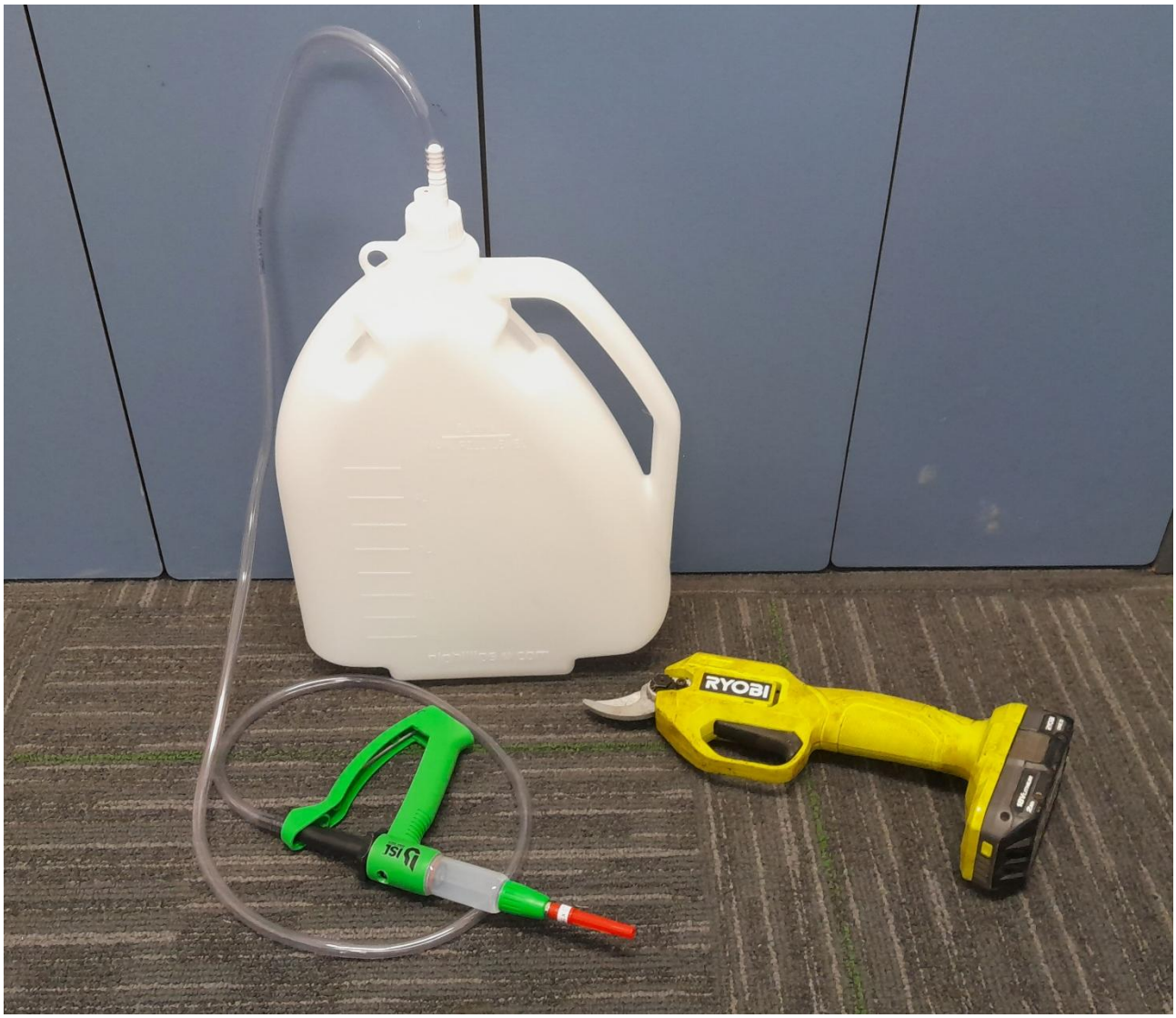

Photo 1: Vaccinator gun, rigid plastic 5 L knapsack, and battery powered secateurs.

This leaves only a small needle hole in the node and makes it difficult to remove much more than a drop, even by shaking the treated stem. It is possible to treat stems even less than 5 mm diameter with this equipment.

However, very small stems usually have a “woodier” node than larger stems. In general, the smaller the stem diameter, the higher the needle resistance is through the node and the higher the chance of needle blockage. Very narrow stems were often cut just below the node to reduce the incidence of blockage.

Herbicide used was AGPRO Steed, containing 520 g/L haloxyfop-P as the methyl ester. With the change in funding focus this year away from Research and Development to Management only, multiple herbicide rates were abandoned. Every plot treated this year received a 100 mL/L (10%) solution of AGPRO Steed.

The adjustable dosage (1 to 12.5 mL) on the vaccinator gun was set to maximum although only partial doses were administered to stems too small to accept the full dose.

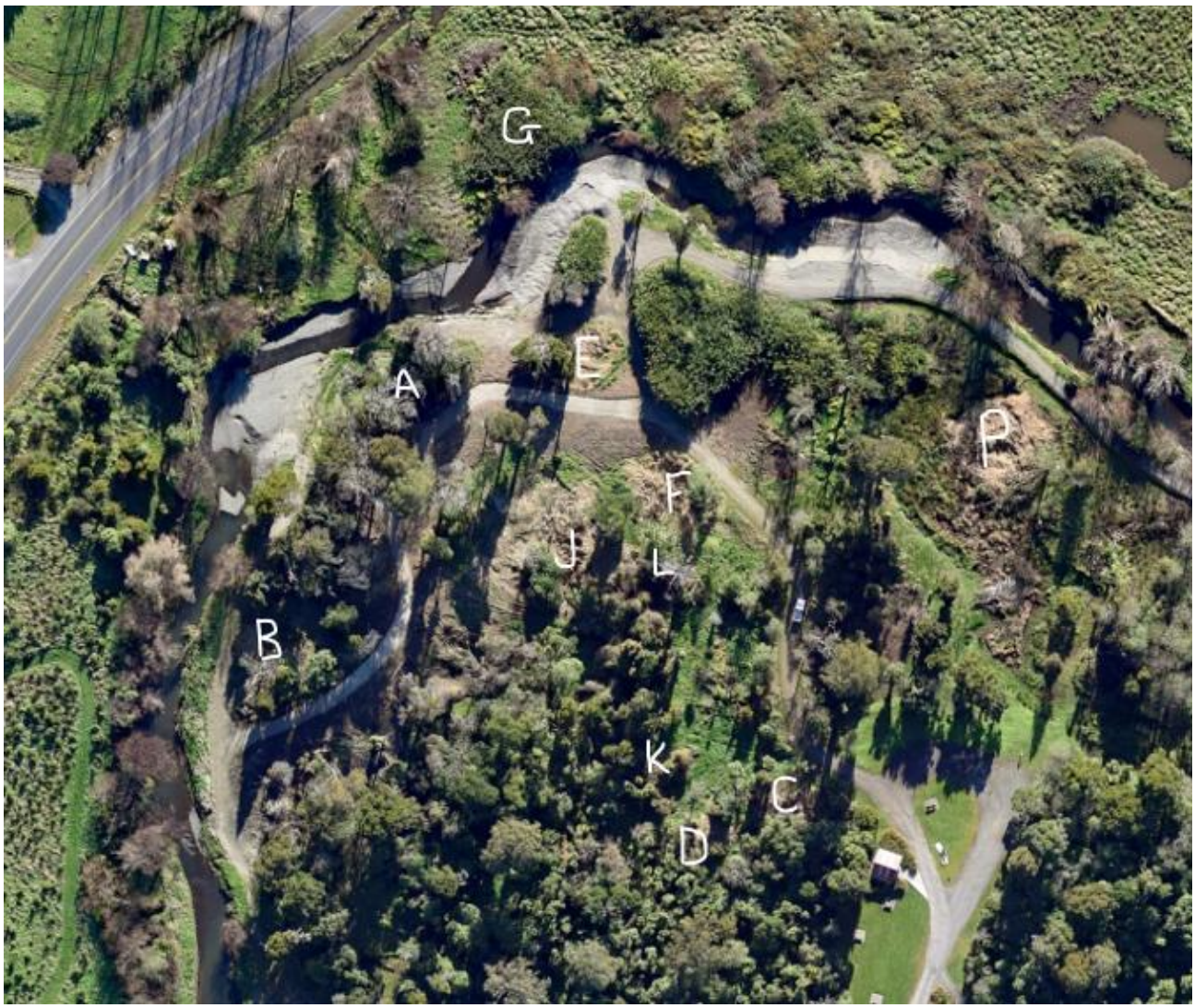

Photo 2: Previous plot locations within Awahuri Forest Kitchener Park, some of which were re-treated this year.

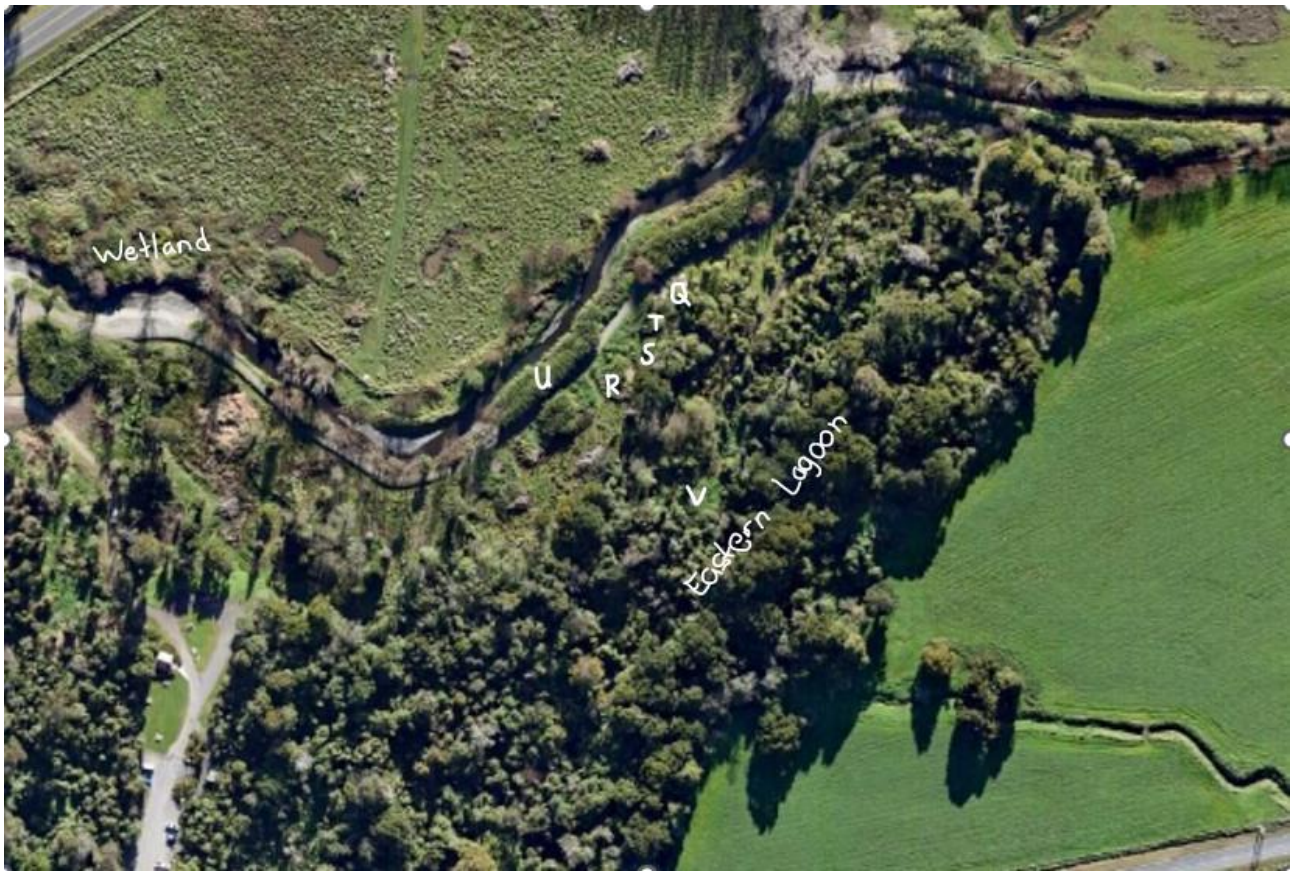

Photo 3: Locations of additional plots – R, S, T, and V – treated this year.

Table 1: *Phragmites karka* cut and inject plots in AFKP.

Plot ID	Treatment Round	Comments
A	3rd	Stems at low density prior to 3rd treatment (in mid-December 2024). Six months after 3rd treatment, regrowth is very sparse and weak.
B	2nd	Dense stems through most of the plot prior to 2nd treatment (in early November 2024). Seven months after 2nd treatment, regrowth is low to moderate density but mostly tall and healthy in appearance.
C	n/a	Not treated in 2024-25. Previously treated twice with 5% solution and regrowth is sparse.
D	n/a	Not treated in 2024-25. Previously treated twice with 5% solution and regrowth is sparse.
E	3rd	Stems at low to moderate density prior to 3rd treatment (in late-December 2024). Six months after 3rd treatment, regrowth is very sparse and most appears weak.

F	2nd	Large variation in regrowth density prior to 2nd treatment but that was also the case prior to the 1st treatment. Regrowth after 2nd treatment (in December 2025) is sparse. Much of the regrowth is of the short, multiple fine-stemmed, "fluffy" type.
G	n/a	The streambank and a thin strip adjacent to that was treated as part of Horizons' River Management work but the rest of the plot was not treated in 2024-25.
J	n/a	Attempted a 3rd treatment on this site but disturbed a paper wasp nest in the weeds after a couple of hours cutting, resulting in two workers being stung. Team moved to a different plot and funding ran out before we could return. Previously treated twice with 20% solution and regrowth is low density in northern end and still sparse at southern end. Regrowth at southern end is possibly invasion of rhizomes from the northern side of the plot but it would require considerable excavation to substantiate that.
K	n/a	Not treated in 2024-25. Previously treated twice with 20% solution and regrowth is sparse and weak.
L	2nd	Previously treated with 20% solution but new operator that day missed many stems and regrowth was moderately dense prior to 2nd treatment. Regrowth after 2nd treatment (in early January 2025) is sparse.
P	2nd	Had previously been the sole plot treated with 2% solution, with very poor results. Prior to 2nd treatment, regrowth was strong and dense. Regrowth after 2nd treatment (in mid-February 2025) is sparse. Regrowth around the edge of the plot is taller with a healthier appearance than that near the centre of the plot.
R	1st	Approximately 100m^2 plot. Part of the early informal trials, it had been treated with glyphosate in 2022 with very poor results. The stand was high density stems when treated with haloxyfop in late November 2024. Six months after 1st treatment, regrowth is low to moderate density but tall, healthy stems.
S	1st	Approximately 75m^2 plot. Part of the early informal trials, it had been treated with glyphosate in 2022 with very poor results. The stand was high density stems when treated with haloxyfop in early December 2024. Six months after 1st treatment, regrowth is low to moderate density but tall, healthy stems.
T	1st	Approximately 100m^2 plot. Part of the early informal trials, it had been treated with glyphosate in 2022 with very poor results. The stand was mostly high density stems when treated with haloxyfop in early December 2024. Six months after 1st treatment, regrowth is low to moderate density but tall, healthy stems.
V	1st	Approximately 350m^2 plot. Part of the early informal trials, it had been treated with glyphosate in 2022 with very poor results. The stand was overall moderate density stems when treated with haloxyfop in early February 2025. Four months after 1st treatment, regrowth is mainly low density but tall, healthy stems.

The following photos show the two plots that have received three treatments.

Photo 4: Plot E on 20/12/2024, immediately prior to 3rd treatment.

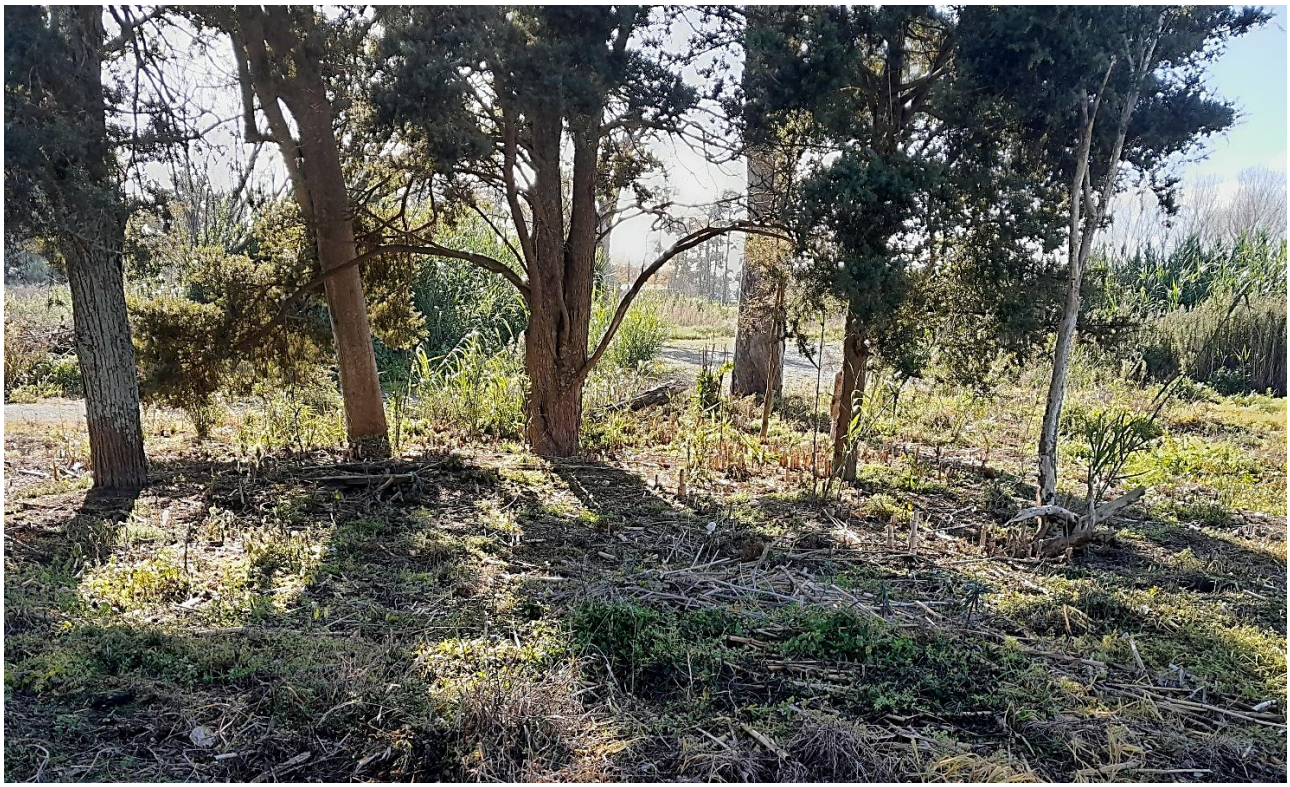

Photo 5: Plot E on 21/05/2025, five months after 3rd treatment.

Photo 6: Plot E on 20/12/2024, at the beginning of 3rd treatment.

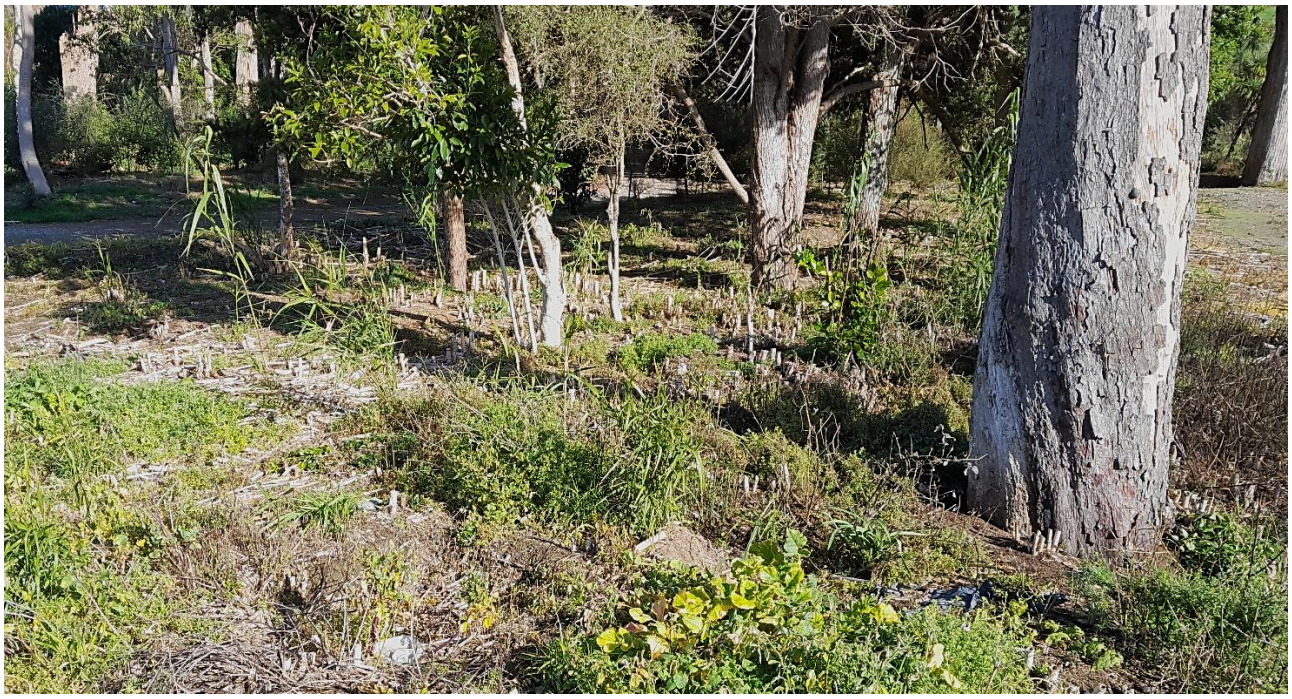

Photo 7: Plot E on 21/05/2025, five months after 3rd treatment. The previous photo was taken from the other side of the large tree on the right of this photo but shows the same part of the plot.

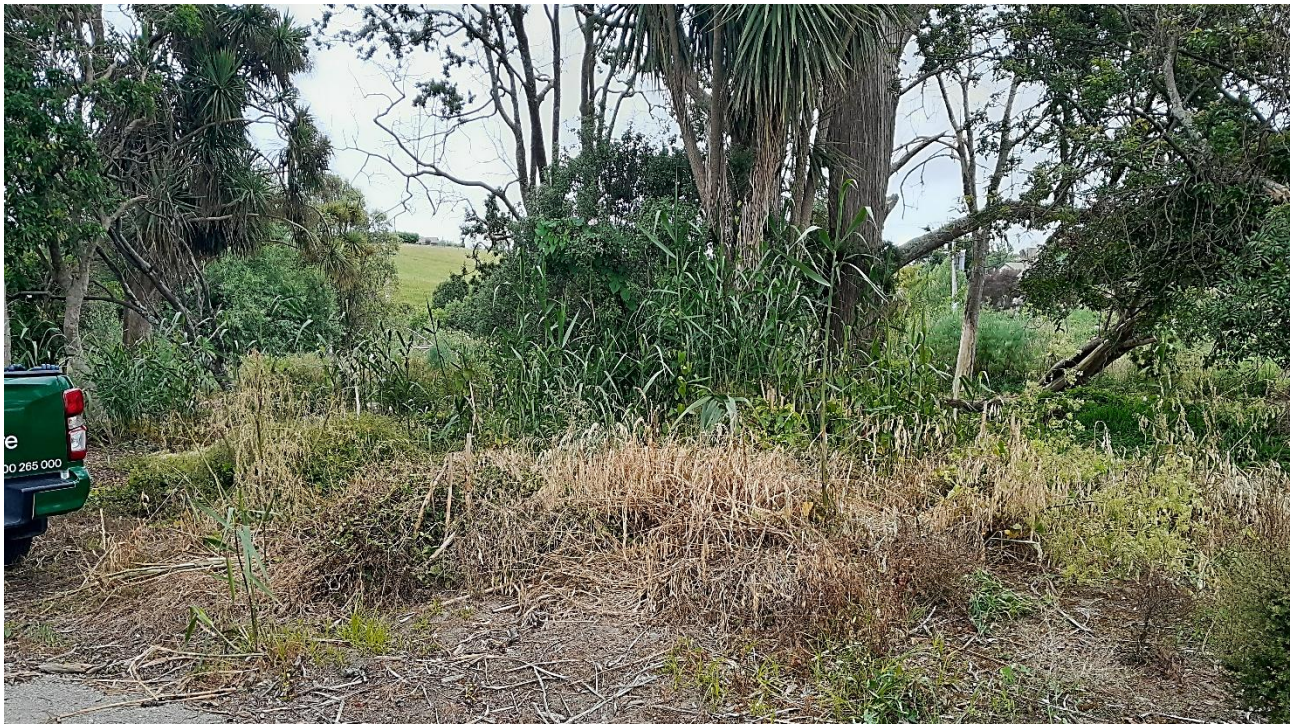

Photo 8: Plot A on 16/12/2024, just prior to 3rd treatment.

Photo 9: Plot A on 21/05/2025, five months after 3rd treatment.

Plots A and E are the only ones to have received three treatments. Observed levels of regrowth have reduced with each treatment, to the point where it is now difficult to even see the regrowth in plot A unless standing near the edge of the plot.

Encouragingly, all the plots that have received two treatments show the same trend. Treating a plot becomes quicker, easier, and less expensive with each successive treatment.

Just how many more treatments will be required to achieve complete kill at each of the sites is still an unknown. While it appears we are achieving excellent results above ground, the below ground situation is more difficult – and costly – to investigate.

There are many unanswered questions about translocation of the herbicide within the rhizomes and even within the stems. Answering those questions will assist with management decisions and will likely lead to further modification of the control methods developed so far.

Initial investigations were undertaken this year and these are discussed in a later section of this report titled Research Funded by AFKP Trust.

Mulch and Spray

Mulch and Spray was the method we proposed for use on extensive infestations such as those along the berms of the Rangitikei River. Cut and Inject is too labour intensive to use on sites with many hectares of stems.

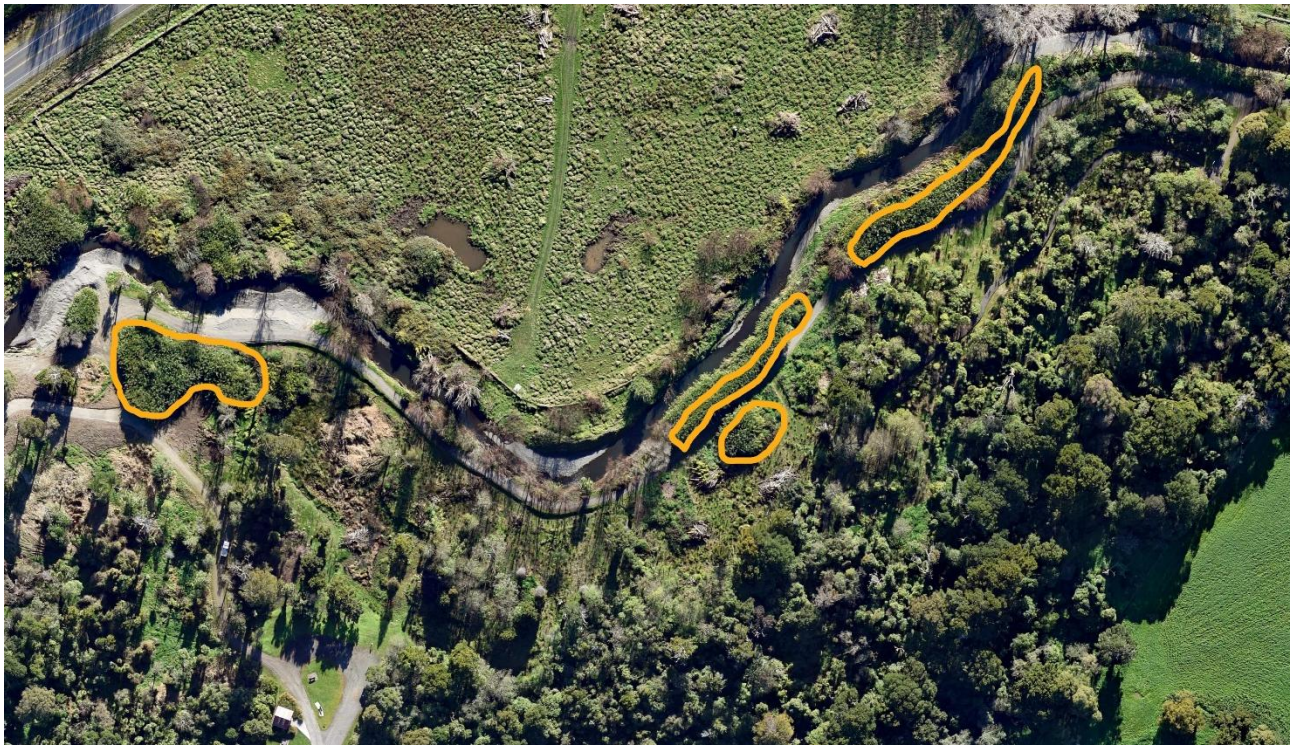

Photo 10: Approximate boundaries of the four areas used for the mulch and spray trials.

A quick recap of last year's Mulch and Spray work is warranted before moving on to the 2024-25 work.

Following the mulching in early September 2023, regrowth was sprayed with 15 mL/L of AGPRO Steed plus 5 mL/L AGPRO Crop Oil on the following dates:

- 01 November 2023
- 30 November 2023
- 10 January 2024
- 23 February 2024
- 14 May 2024

Regrowth levels decreased after the fourth (February) spray application and were very minor following the fifth (May) application.

In the end of year report for 2023-24, I stated that it was unknown how much of the decrease could be attributed to spraying and how much was seasonal.

Monitoring of regrowth levels through spring 2024 showed that the previously observed decrease was related to seasonal factors rather than the effectiveness of the spray treatments.

Due to reduced funding levels, we decided to continue treating two of the four plots and each of those received two spray treatments this financial year. Dates were:

- 11 November 2024
- 17 December 2024

Photo 11: 04 November 2024 - immediately following 6th spray application.

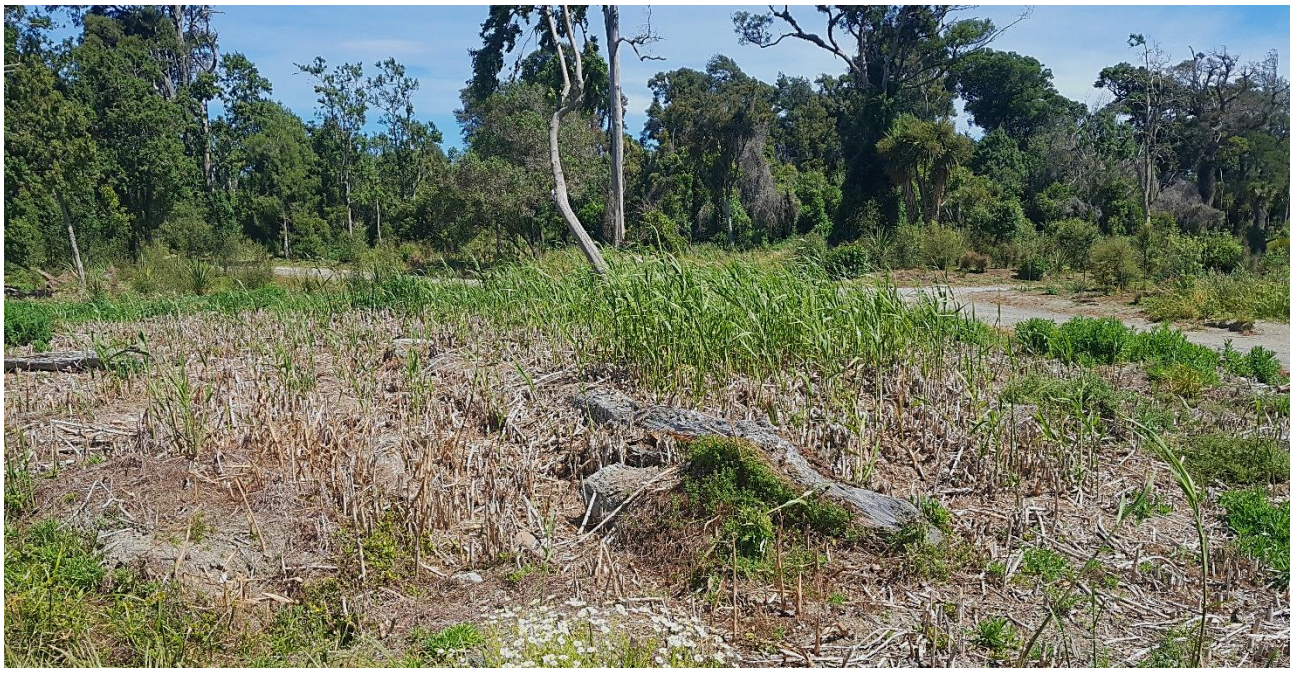

Photo 12: 11 December – prior to 7th spray application.

Regrowth levels following the seventh treatment in December were equivalent to that observed after the early treatments.

Photo 13: 13 January 2025 – 27 days after 7th spray application. Regrowth as strong as ever.

As with Auckland Council's experience with amitrole and imazapyr[2], haloxyfop appears to be ineffective against the rhizome system when applied as a spray. Seven applications of haloxyfop within 14 months had no significant effect on levels of regrowth.

The decision was made to abandon further spray treatments and leave all the Mulch and Spray plots until there was funding to treat them with the Cut and Inject method.

[2] The sale of imazapyr has been discontinued in the New Zealand market since early 2023.

Research Funded by AFKP Trust

As stated in the Introduction, the AFKP Trust funded work that was over and above the scope of this year's KKT funding.

The reader should note that the word research used in this section's title is used here in a very broad manner to describe the investigations undertaken by Green by Nature on the Trust's behalf. Investigations were largely observation-based and funding levels did not allow for formalised data recording and statistical analysis.

Quite possibly the most significant question from previous work was how far the herbicide mix is translocated within the rhizome system. Before attempting to answer that, I thought it was prudent to better understand how far the mix travels before it becomes ineffective in stems.

Herbicide Translocation in Stems

In 2023, a former Department of Conservation Ecologist, who had been undertaking seed collection work for the Trust, advised us that it wouldn't matter how high we cut the stem. He believed the mix would make it to the rhizome regardless. While we hoped he was correct, we continued to cut most of the stems shorter than we had done at the start of the trials.

I examined thousands of previously treated stems and found stems that I believed to have been cut too high were often the most useful for this investigation. Some treated stems were around one metre tall with up to 10 nodes above ground level.

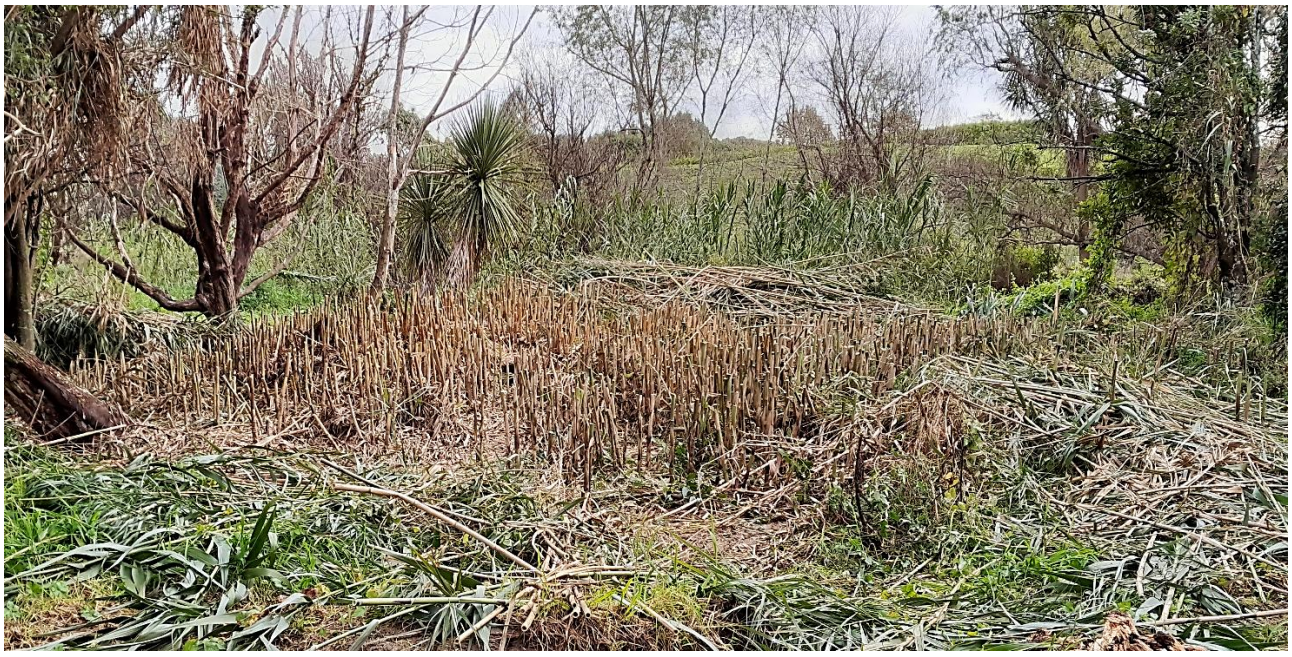

Photo 14: Plot B after first treatment – a typical example of cutting stems high in the early stages of the trial work.

Usually, these very tall stems had dead nodes at the top and one or more live nodes near the base. Live nodes often had regrowth and were generally easy to differentiate from dead nodes by the colour and smoothness of the internodal stem section.

The number of dead nodes above a live node most often varied between three and six but occasionally exceeded six. One notable stem had eight nodes above ground, all were dead and there was no sign of regrowth from anything below ground in that vicinity.

However, it was not uncommon to find tall stems with few nodes (i.e. long internodal sections) that were dead to at least ground level, easily snapping off when kicked. Note that the dye added to the herbicide mix was quite noticeable in most stems snapped at ground level.

Additionally, there were examples of stems with very short internodal sections with live nodes at the base even though they had been cut at a height that resulted in death of typical stems.

The number of nodes the herbicide mix travelled through appeared to be more significant than the distance travelled.

Overall, cutting and treating the stem as close to ground level as possible increased the likelihood of killing the stems. Cutting stems high decreased the likelihood of killing the stem and often resulted in regrowth from any live nodes lower on the stem. This is likely due to the number of nodes the herbicide mix must travel through.

Currently, I have no explanation for the high variability in number of nodes killed by the herbicide mix.

Herbicide Translocation in Rhizomes

In the previous trial plots, regrowth from rhizomes was observed to be the greatest where stem density was low and vice versa. The best example of this was observed in Plot J, where stem density ranged from < 1 stem per m^2 to > 600 stems per m^2.

Regrowth was sparse where stem density was very high. The fact that there was any regrowth in those areas lends weight to the theory that the herbicide does not move far within the rhizome network. I suspected that rhizome sections with many close stems were killed and rhizome sections between [relatively] widely-spaced stems survived due to limited herbicide translocation.

We had no proof of translocation issues nor of the origin of the rhizomes that were sending up the new growth. It was possible they had come from adjacent low density areas or, simply, that they were not attached to any of the treated stems/rhizomes.

In early June 2025, we excavated several areas of Plot E, one of the two plots that have had three treatments and are showing little in the way of regrowth.

Our first excavation was around a new stem of approximately 10mm diameter, emerging from the soil in an area that was surrounded by dead stems. We found the origin of the new stem was a rhizome about 150mm below the surface. At least as far as we could see within the excavated zone, that rhizome was not connected to any of the dead, treated stems.

The second and third excavations were to remove the rhizomes under a small patch of dead stems. All dead stems had no more than three nodes visible above the soil surface. Examination of rhizome sections below that included cutting through the roots from each node. Roots from the uppermost two or three nodes appeared to be dead but any roots below that appeared to be healthy.

When each dead internodal section on the stems were cut, blue dye was only visible on the uppermost node of the dead rhizome sections. Even then it was faint on the underside of that rhizome node.

However, the effects of the herbicide seemed to reach further than the dye would suggest – one or two nodes below the point the dye stopped were also dead.

The low number of dead nodes on the excavated rhizomes supports our theory that the herbicide does not translocate far in the rhizome network.

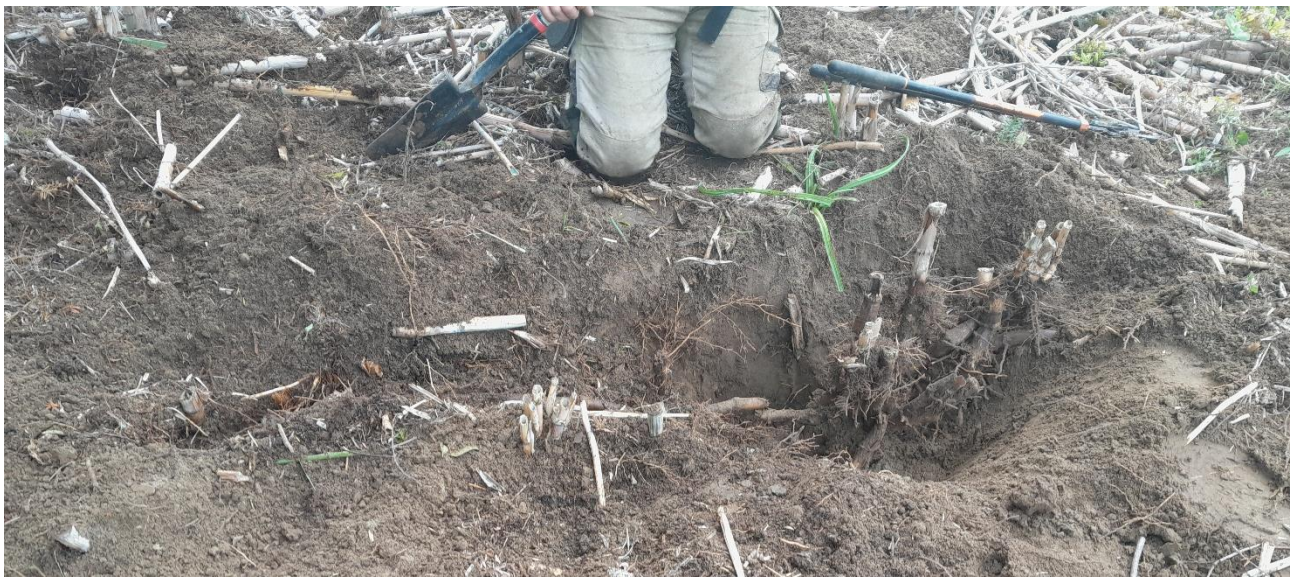

Photo 15: Over one metre of live rhizome found between two groups of dead stems in Plot E. The group of stems on the right originated from three different rhizomes.

What was surprising is that there was so little regrowth from what appears to be a substantial amount of live rhizome material. In the Mulch and Spray plots, regrowth is strong and dense still but the Cut and Inject plots are all trending towards weak and sparse regrowth.

The low number of rhizome nodes being killed by the Cut and Inject method, and all the remaining lengths of live rhizome, would lead us to expect similar regrowth levels to the Mulch and Spray method. That is clearly not the case.

Despite not killing much of the rhizome, the Cut and Inject method is having a significant effect on regrowth levels. Recent observations on work undertaken on the Makino Stream infestations for Horizons Regional Council's River Management Team support what we see in AFKP. Sites that received a single treatment in 2023-24 were still showing much reduced regrowth levels compared to the Mulch and Spray plots.

While not achieving a complete kill, the Cut and Inject method appears to be impacting the vigour of the plant.

CONCLUSIONS

The Cut and Inject method continues to show promising results. Regrowth levels decrease with each successive treatment and the plots that have had three treatments have little in the way of regrowth.

Spraying regrowth ultimately proved to be ineffective. Decreases in levels of regrowth near the end of the previous financial year have now been attributed to seasonal factors. The Mulch and Spray method has been abandoned.

Mulching will likely be a valuable first step in future Cut and Inject operations where the infestation contains a lot of old, dead stems and/or stems leaning towards the horizontal mixed with vertical stems.

Future work should investigate options for increasing herbicide movement within stems and rhizomes. A range of additives would be a sensible place to start and other options may include a different method of applying the herbicide (e.g. spraying or dabbing herbicide mix onto the surface of a fresh cut).

Confirmation that there are considerable lengths of live rhizome material under plots showing little in the way of regrowth leads us to yet more questions:

- Why is there so little regrowth if the rhizome network is as healthy as it appears to be?
- If we are only killing the stems and a few nodal sections of the rhizome, why is the injection method so much better at reducing regrowth levels than killing the stems by spraying?
- Are sub-lethal doses of haloxyfop in the rhizome having a large impact on plant vigour?
- How long will the rhizome network survive if we continue to treat the stems it does produce?

There is a considerable amount of development work still required on *Phragmites karka*.