Future Management Plan to Enhance the Ecological Restoration and Biodiversity of the Chrystalwood Lane Red Zone, Governors Bay

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Executive Summary

- What would a management plan look like that enhances the ecological restoration and biodiversity of the Chrystalwood Lane Red Zone in Governors Bay?

- Methodologies included data collection from bird counts, vegetation plots, photography (on the ground and drone), LiDAR and GPS. Data was analysed in Rstudio through abundance and richness. GPS information was analysed using GIS, to produce a map. Secondary research also played a vital role in our project's findings.

- Our findings were limited by time restraints, preventing data collection at optimal times,

History of the Area

Banks Peninsula is primarily composed of lava flows and other volcanic products from two large Miocene-age volcanoes: Akaroa and Lyttleton (Wilson, 2013). These volcanoes formed over older terrain with some parts exposed in the Gebbies Pass area, which is approximately 11.5 km away from Governors Bay (Wilson, 2013). The oldest of these rocks dates back to 220 million years ago, in the late Triassic-age (Wilson, 2013). These sedimentary rocks form the geological backbone of the Aotearoa (Wilson, 2013). The oldest volcanic rocks found in Gebbies Pass are rhyolites that date back to 80 million years ago, from the Cretaceous times (Wilson, 2013). These are much older and of different composition from the rest of the Peninsula (Wilson, 2013). The main volcanic rock types that are found on Banks Peninsula consist of basalt, andesite, rhyolite, hawaiite, and trachyte which differ in the proportions of their main chemical compounds, particularly silica (Wilson, 2013).

Human history began when Waitaha came to the upper reaches of Whakaraupō in the fifteenth century, setting into family groups rather than in sizeable pā (Robertson, 2016). They named the Peninsula ‘Te Pātaka o Rākaihautū’, after their chief and because of the abundance of food supplies (Robertson, 2016). They were soon joined by Ngāti Māmoe in the late sixteenth century, who settled in Governors Bay in significant numbers (Robertson, 2016). However, by this time, the Peninsula was already showing signs of depletion (Robertson, 2016). Around 30 species of bird, including moa, were all but extinct and about a third of the original podocarp forest cover of the Peninsula had been removed by fire (Robertson, 2016). Māori burning of the forest is evidenced by charcoal and buried forest soils (Robertson, 2016). This situation worsened from the 1790’s onwards when European sealers arrived to New Zealand shores (Robertson, 2016). Shortly after, flax traders and whalers were attracted to the land, which opened up opportunities for trading with Māori (Robertson, 2016). With this, European diseases spread to Ngāi Tahu on the Peninsula, leaving them vulnerable (Robertson, 2016). In between the arrival of Europeans and the 1900’s, almost all of the remaining forest was cleared by burning or milling (Robertson, 2016).

Current and Relevant Literature

It is crucial to critically analyse relevant research associated with our project to base our understanding on research findings. Literature was reviewed individually focusing on different areas to do with our project including the five main topics.

Regeneration Planting

A recurring finding in the literature is the importance of considering the original forest.

Zone falls under both Predator Free 2050 (Predator Free NZ, 2024) and Pest Free Banks Peninsula (Pest Free Banks Peninsula, 2023). There is no singular method of pest management that fits all. Small areas of land are greatly underrepresented in the literature but several papers considering fragmented sites (Barney et al., 2021; Morgan et al., 2022), and a few at larger sites (Johnstone et al., 2023; Patterson et al., 2024) provide knowledge relevant to the Red Zone. Both trapping and baiting are effective methods for control, however baiting may require more monitoring and have greater risks to domestic animals (Russsll et al. 2015). There is a consensus that management plans need to be adaptive towards technological advancements and prioritise monitoring not only for success of control methods but also the risk of reinvasion, non-target species release (Barney et al., 2021; Morgan et al., 2022), and residual populations following control (Patterson et al., 2024).

Track Development and Maintenance

The development and maintenance of walking tracks requires balancing accessibility, whilst also protecting and conserving the environment. The views of the local mana whenua, Te Hapū o Ngāti Wheke, must be considered to ensure the work is helping to restore mauri to the area's native forest (Cook and Harrison, 2002). The economic investment and evaluation of track forming practices must also be considered as it demands labour and resources (Cook and Harrison, 2002). Tracks attract locals to the area which can increase volunteer engagement, another reason why it would be a huge advantage to the area to have an accessible public walking track (Cook and Harrison, 2002). Unmaintained tracks can result in adverse environmental outcomes and poor visitors' experience, decreasing visits to an area (Hawkes et. al., 2013). Hawkes et. al. (2013) argues maintaining track systems, such as reliably predicting the stability of tracks, should be done using GIS-based technology. GIS would be useful for surveying the condition of the tracks if the area was to become too risky to enter due to rockfall or major slips, for example. Maintaining tracks amidst seasonal changes is vital. There are gaps in current literature which estimate how climate change, including increases in extreme weather events, will affect the maintenance of tracks, therefore regular inspections and upkeep is essential.

Community Engagement

Community engagement and collaboration is key for ecological regeneration project success to help boost a vibrant biodiverse Red Zone with abundance of native plant and bird species. Research suggests active community involvement, particularly with volunteers/community members, allows for adaptive management and education that fosters a long term social and ecological connection and kaitiakitanga of the place (McDonald, 2021). Building relationships between local communities, iwi, professionals and institutions is required for a successful

outcome, but also relies on shared goals regarding both ecological or social priorities (Galbraith,

Methods

Vegetation Counts

Vegetation plot locations were chosen along a track on the south-facing slope for accessibility, each plot approximately 40 metres apart (Fig. 2.). Two of the locations were completed on the lower north-facing edge, to

Five-Minute Bird Surveys

For five minutes observers watched and listened for birds within 25 metres of the six vegetation plot GPS locations (Fig. 3.). Auditorily and visual

Vegetation Data

Over the six sample locations, a total of 46 different plant species were found and are listed in appendix 1. 27 of these species were natives and 19 exotic. Plot 3 and 6 had the greatest species richness overall (Fig. 4). Native species richness was at a similar level across all plots with the exception of 4 and 5 which were completed at the site previously occupied by Trips house and the fir tree plantations (Fig.4). Douglas-fir, mahoe, mountain ash and gorse had the greatest percentage of canopy cover across all sites (Fig. 5).

Bird Count Data

Figure 5. Total Vegetation cover of species with greater than 30% cover across sample sites.

Figure 6. Bird species frequency distribution across six sites.

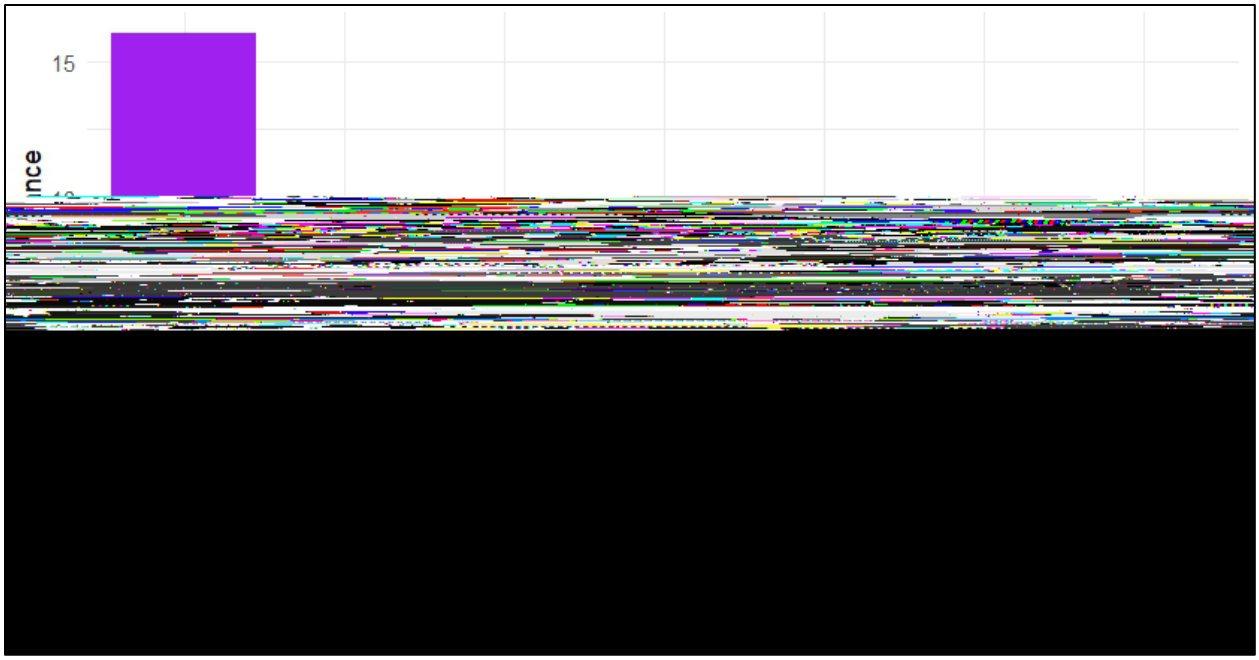

Figure 7. Bird species abundances of the seven most frequent bird species.

Site Photographs

Site photographs, figures 8 to 15, show variation in the distribution of vegetation and land use.

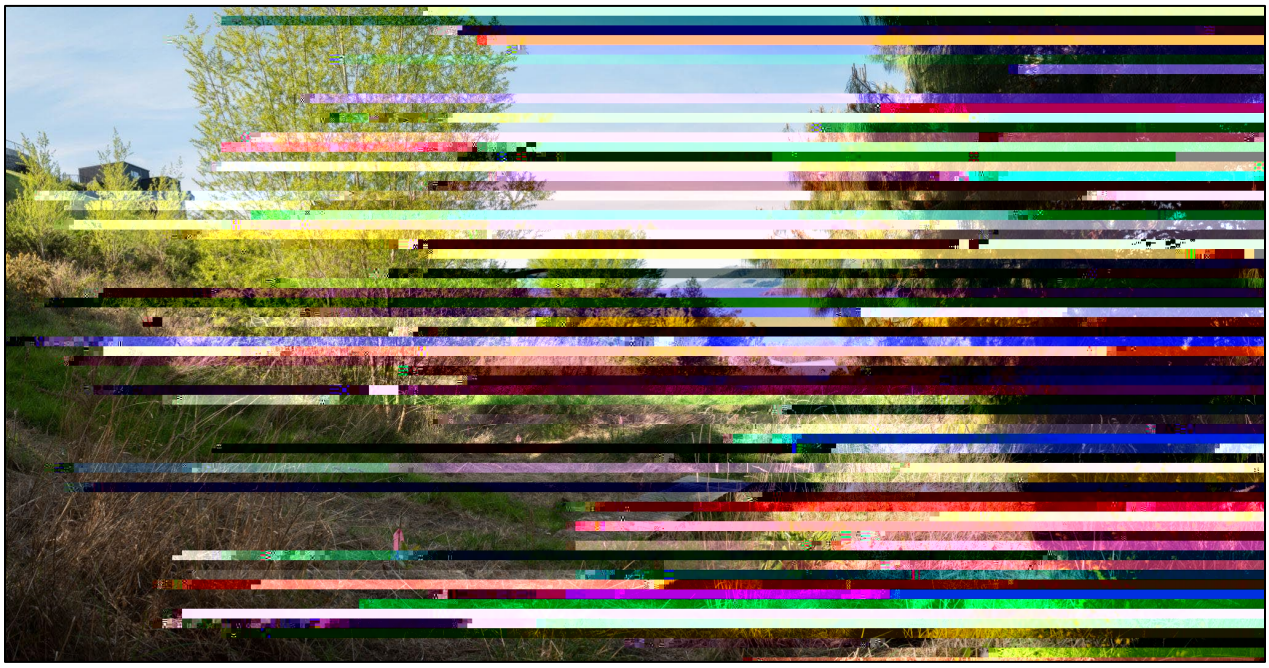

Figure 8. Photograph taken at the bottom of the Red-Zone bush facing East towards the site previously occupied by Sally Tripp's house. A small wooden bike jump construction is visible in the foreground.

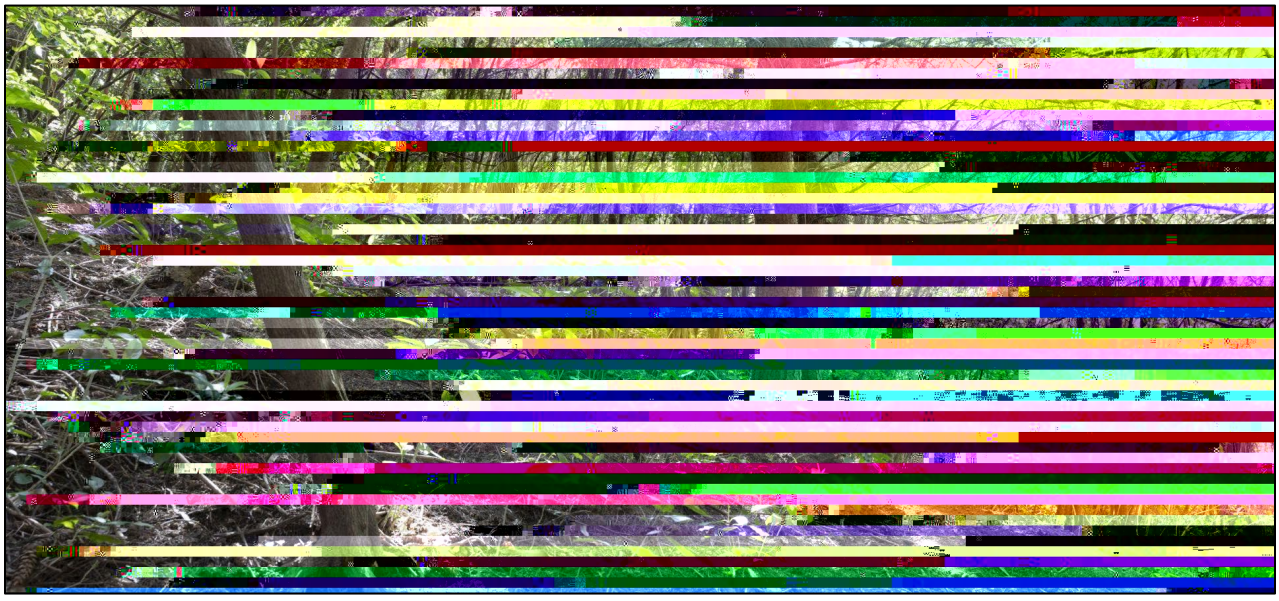

Figure 10. Photograph facing West from the upper part of the fur tree plantation on the northern-facing side of the valley.

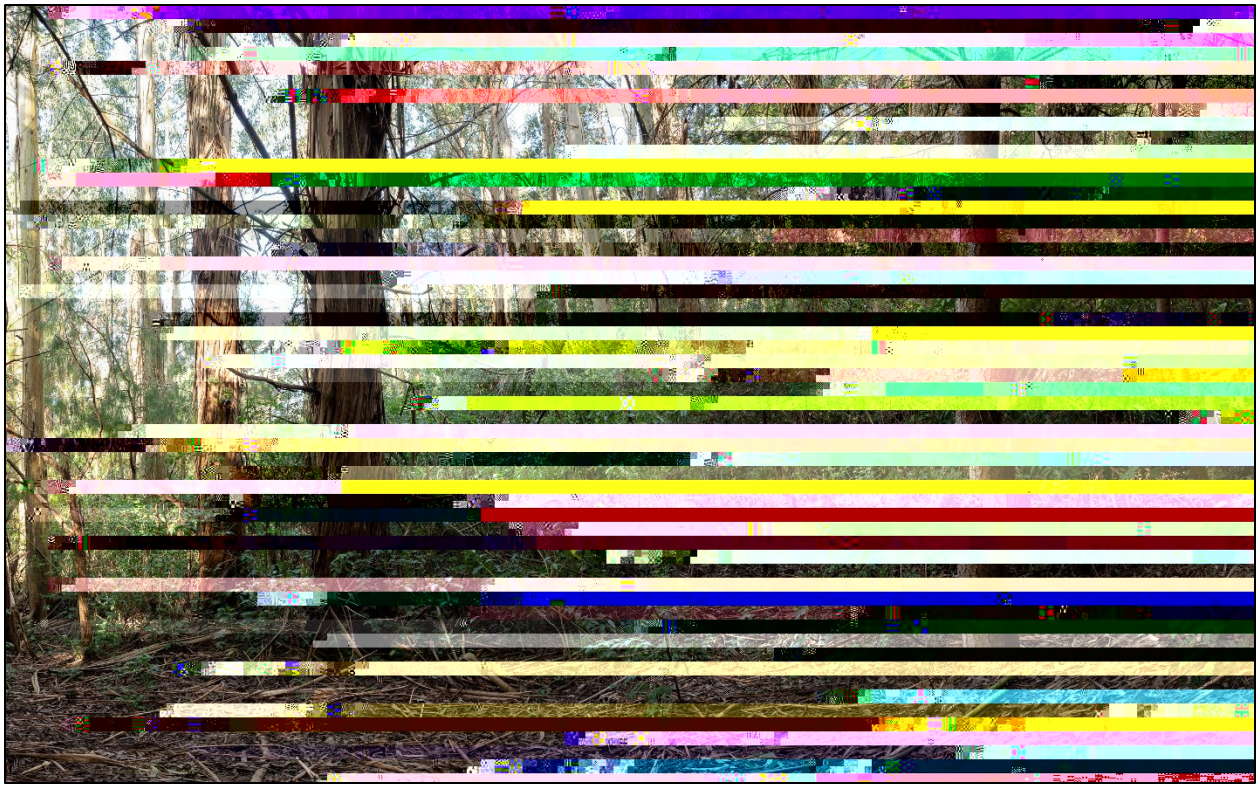

Figure 9. Photograph taken facing southeast looking into the Eucalyptus plantation and the undergrowth of native plant species from the Fur tree plantation.

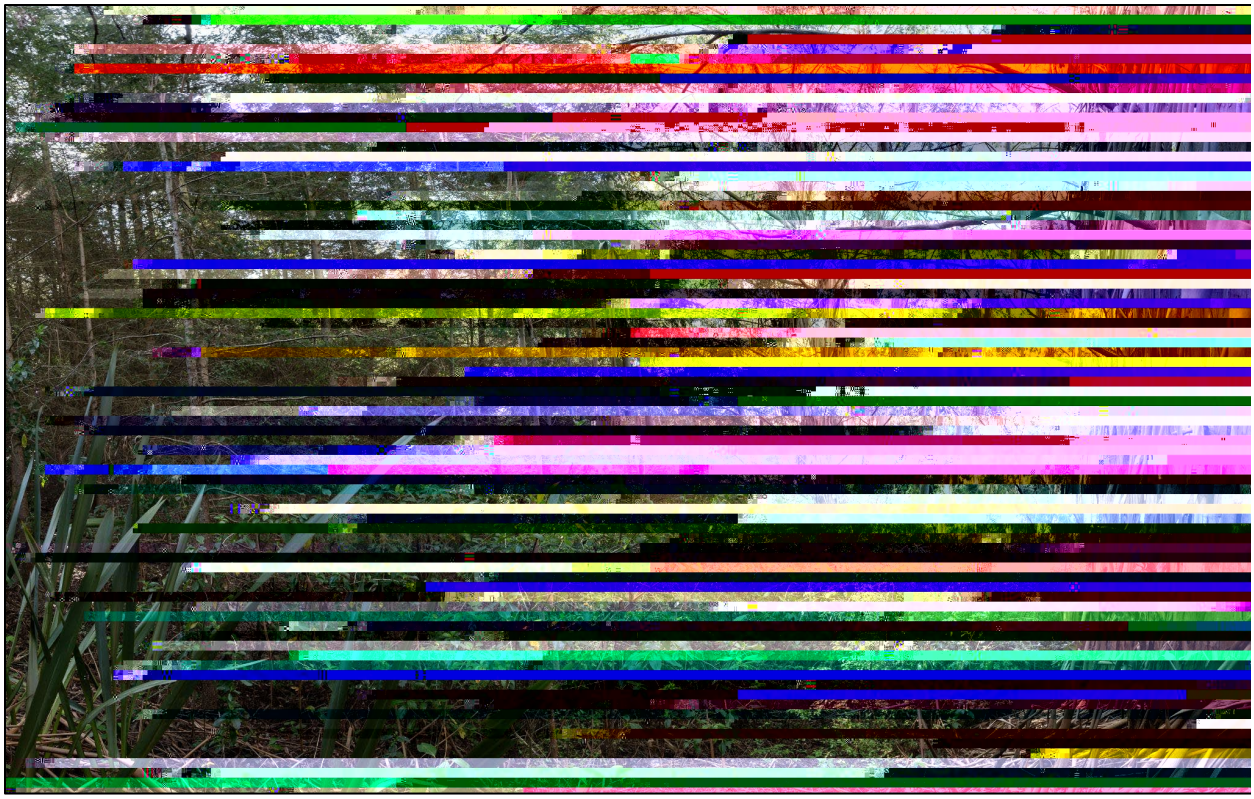

Figure 10. Photograph facing north down valley from the edge of the eucalyptus plantation bordering on the fur plantation. Native plant species form undergrowth in the foreground and a flax plant is on the left.

Figure 11.

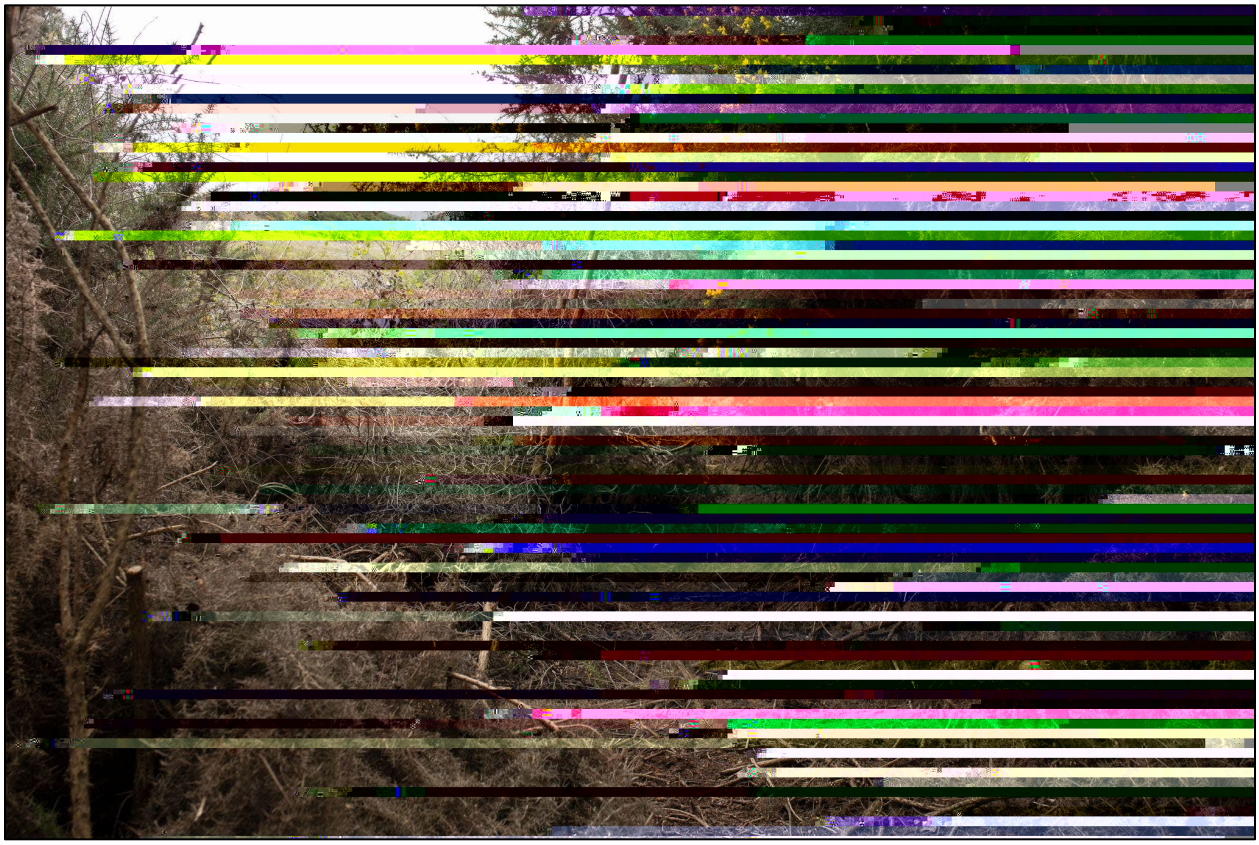

Figure 13. Photograph facing West up a section of thick gorse and M. Australis (mid-left) cut back by Kerry in the central area of the redzone.

Figure 15.

Track map

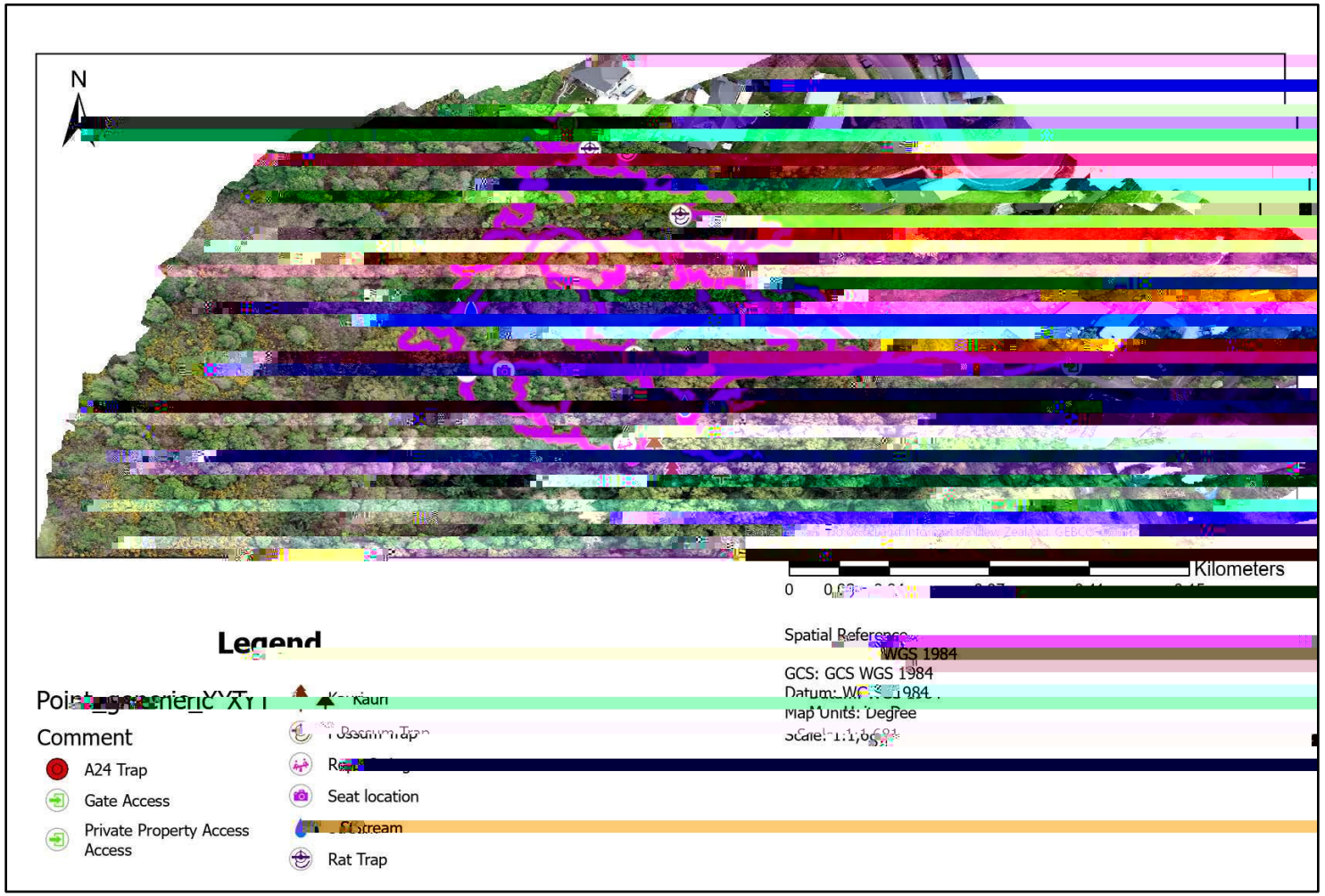

Figure 16. GPS tracks overlaid on top of drone footage data of Red Zone at the end of Chrystalwood Lane, Governors Bay. Legend indicates the location of key features including pest traps, stream crossings and the location of a future potential seat with a view of the bay.

Future Recommendations

Health and Safety

The Red Zone ranger, Zane Lazare, recommends the “community stay out of the Red Zone” due to safety concerns (personal communication, August 23, 2024; Newsline, 2024). There is a lack of budget for planning the Port Hills Red Zone, and for an up-to-date geotechnical assessment. A

to mitigate its harmful effects (Müller, et al., 2014). This project does not propose to use large

Figure 17. Various weed species photographed and identified throughout the Red Zone.

Vertebrate Pest Control

Aotearoa's unique wildlife is highly vulnerable to introduced predators making community involvement crucial for trapping. Aligning with the existing pest management plans, such as Predator Free 2050 and the Pest Free Port Hills (PFPH) initiatives, will provide the community with information, guidance and a long-term strategy aiming to eradicate possums, rats, and

and habitat type. A 100 m x 25 m grid in the Red Zone would need seven traps, placed 25 m apart along on ridges, spurs, near water sources and bush edges. Monitoring will be key for progress using apps such as Trap.NZ. PFPH suggests alternate ways to prevent pests through rodent-proofing surrounding properties to address the challenge of reinvasion and meso-predator release (Morgan et al., 2022). Hence the importance of community engagement and conservation groups, to support and educate the community on effective trapping.

Best Track Forming Practices

Turner has created an interconnected network of tracks throughout the bush from a pre-existing farm track. These tracks require evaluation before being open to public use. GPS and drone footage data was used in collaboration to map existing tracks, providing a foundation for future planning (Fig. 16.). Areas on either side of the ephemeral stream could be considered ‘safer’ areas for human activity, with the greatest rockfall risk being through the middle of the land where the gully forms. There is potential for these areas to be deemed safe for walking tracks to be developed. Regular ground maintenance should be conducted in combination with GIS technology, which brings environmental factors such as track elevation, vegetation type and cover and soil types into consideration (Hawkes et. al., 2013).

Future Planting

We recommend planting vegetation that will restore the land to its original state while also creating a diverse ecosystem (Burrows, 1994). This can be done by planting species that will attract frugivorous birds, a list of native plants which have fruit and seeds can be found in Appendix 2 (Burrows, 1994). This will enhance the biodiversity in the area, which will attract wildlife. Tripp (1998) created a book of plants found on Banks Peninsula and identified several ecosystem types around Banks Peninsula. Governors Bay would fall under the ‘Mataī, Tōtara, Kererū, moist forest ecosystem’ (Tripp, 1998). In Appendix 2, all species that come under this ecosystem type, are recommended to be planted (Tripp, 1998). Many of the species recommended have been identified in high abundance within the area already. A list of fire-resistant plants can also be found in Appendix 2 (Reduce your fire risk, n.d.). High-flammable species, such as Mānuka and Kānuka, should be planted sparingly (Reduce your fire risk, n.d.).

Community Involvement

The restoration project aims for long-term ecological and social impact. However, limited time and lack of public access to the Red Zone limited the ability of this project to engage extensively with the community. When possible, organise practical workshops and working bees focused on

weed control, native planting, pest trapping, gathering and monitoring data. These activities will provide opportunities for learning and co-creation among locals, conservation organisations, Cholmondeley, youth, and iwi. The Governors Bay Community Association should share

Conclusion

Although this area has huge potential, it has not been deemed safe for people to be present inside it yet, hence the recommendations for the project have been affected by health and safety concerns. It is recommended to wait for an updated geotechnical assessment to be completed (12-24 months), which would provide an updated rockfall risk assessment within the area. It is recommended to continuously evaluate the condition of walking tracks, plant fire-resistant natives, cut back on , utilise Weedbusters for controlling high priority weeds as invasive plants act as a significant barrier for native plant regeneration. In addition, NAWAC humane traps should be utilised for controlling vertebrate pests. Small and achievable projects, which engage the community, such as plantings, are important for keeping locals active and engaged in the area. Literature highlights the importance of community engagement, collaboration, adaptive management, and education in the long-term success and wellbeing of ecological restoration projects. The local mana whenua, Ngāti Wheke, should be consulted throughout all stages of working within this area.

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Appendices

Appendix 1: Plants present

Scientific name	Māori Name	Common name
		Agapanthus
	Makomako	Wineberry
		Bamboo
		Old man's beard
	Mingiming	
	Taupata	Mirror bush
	Karamu	
	Mingimingi	
	Tī kōuka	Cabbage-tree
	Karaka	New Zealand laurel
		Frosted-Chocolate
	Houhere	Macrocarpa
	Akeake	Hop Bush
		Pride of Madeira
		Mountain-ash
		Japanese-aralia
		Fennel
	Kōtukutuku	Tree-fuchsia
	Kāpuka	

Pohuehue

Appendix 2: Recommended plants

	Tainoka	NZ broom	-Mataī, Tōtara, Kererū, moist forest ecosystem
		Climbing broom	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Putaputawētā	Marbleleaf	-Mataī, Tōtara, Kererū, moist forest ecosystem
		Clematis	-Mataī, Tōtara, Kererū, moist forest ecosystem
		Clematis	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Puawānanga	White clematis	-Mataī, Tōtara, Kererū, moist forest ecosystem
		Thin-leaved coprosma	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Mingimingi		-Mataī, Tōtara, Kererū, moist forest ecosystem
	Mikimiki	Yellow wood	-Attracts frugivores -Mataī, Tōtara, Kererū, moist forest ecosystem
	Karamū	Shining Karamū	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Mingimingi		-Green firebreak -Attracts frugivores -Mataī, Tōtara, Kererū, moist forest ecosystem
	Mingimingi	Twiggy coprosma	-Mataī, Tōtara, Kererū, moist forest ecosystem
		Stiff mikimiki	

	Houhere	North Island Lacebark	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Huarau	Thousand-95 0 Td 9	

	Kōhia	NZ passion vine	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Kaikōmako	Duck's foot	-Green firebreak -Attracts frugivores -Mataī, Tōtara, Kererū, moist forest ecosystem
	Harakeke		-Mataī, Tōtara, Kererū, moist forest ecosystem
	Maratata		-Mataī, Tōtara, Kererū, moist forest ecosystem
	Kawakawa	Pepper tree	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Tarata	Lemonwood	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Kōhūhū	Black Matipo	-Mataī, Tōtara, Kererū, moist forest ecosystem
	Mānatu	Lowland ribbonwood	-