Plant-based structures:

Growing a textile practice in an ecologically local context.

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Design and Creative Technologies

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Figure 1. *Kete basket braid,* 16.04.2023, harakeke (New Zealand flax, phormium tenax) textile structure, AUT North Campus.

Abstract

Planted firmly in textile design, this practice-led research engages with the natural and landscaped environment as places of experimentation. The dynamic relationship surrounding site-specific local ecologies and plant-based materials, makes for a nuanced and intricate starting point. Custom-designed 'textile structures' encompasses a series of site-specific experiments, utilising abundantly available, appealing plant fibre materials, which are economically and ecologically sustainable. Prototyping acts as a vehicle for the hybridization of tacit, practical and theoretical knowledge systems. Underpinned by values of service time, temporality, and ecosystems, they are designed to be mutually supportive 'partners' for short-term life cycles and applications. Through natural weathering and biodegradability, nutrients can return to the land from which they were harvested. This project highlights making practices that are driven by plant materials in structures that are compatible with local ecologies. Decisions within the design process are guided by working in collaboration with the site and allowing for opportunities to be expressive with materials. The research acknowledges the physical properties of plant-based materials as active participant-citizens, adding value to their usage in customary and experimental making techniques such as plaiting, braiding, and weaving. Through practices of human disturbance; tending, harvesting, foraging, care, and observation, a reciprocal human-plant partnership emerges. This project questions what can be uncovered through a hands-on introspective textile creative practice, whilst working with plants in an ecologically local context. The intention of this research is to learn about locally sourced plant species, to gain knowledge regarding their use within creative practice-led materials driven making, and to demonstrate an evolved perspective regarding their value and potential.

Attestation of Authorship

"I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning."

30th May 2023

List of Figures: All works by Neesha Johnson unless otherwise noted

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A note on language and terminology: clarifying specific terms within the research project.

1. 'Textile structure' references textile forms working alongside or in collaboration with something else, offering different styles and levels of support. This wording encompasses a broader range of potential applications than 'agrotextiles.' Author Paul (2019) describes agrotextiles as textiles employed in agriculture and horticulture to safeguard plants, establish microclimates for temperature and species control, maintain moisture levels in soil, and gradually weather the environmental conditions.

2. 'Garden', 'ecology', and 'landscape' are related terms, however academics Uwajeh and Ezennia (2018) explain how their meaning varies. Within the context of this project, gardens are a designed piece of land cultivated by humans, close to a domestic residence, and often have a multitude of purposes providing fruit, vegetables, plants, and flowers. A landscape refers to visible features within a space, such as human made buildings, and naturally made rivers. Ecology focuses on interactions and relationships between different living species within an environment.

4. 'Local' is any location within thirty-minute walking distance or fifteen-minute driving distance from my residence in Tāmaki Makaurau, Auckland. In this research, it refers to socially responsible engagement with systems, places, and cultures within the community, focusing on meaningful connections and responsibility to look after the immediate surroundings (Ricciardelli and Borgonovi, 2018).

5. 'Plant material' and 'plant species' will be used to challenge dominant narratives, acknowledging the role of living creatures alongside human beings, both of which require variations of sustenance, water, and nutrients. Author Merfield (2022) illustrates that environmental terms are often positioned from the perspective of humans. This is problematic as it prioritizes singular value systems and interests over

that of other species of plant; desired plant (crop), other plant (alliae plantae) and unwanted plant (weed) are positioned in a similar manner.

6. 'Sustainability' is defined as something that fulfils current requirements while safeguarding the capacity of future generations to satisfy theirs (Paul, 2019). However, in the context of this project, the wording 'economically and ecologically viable' will also be used when referring to sustainability in plant-based textile structures.

7. 'Service time' refers to the timeframe in which a textile structure executes its intended functions. Author Paul (2019) proposes this encompasses the whole life cycle of selected materials, including the decomposition process.

9. As Pākehā, (New Zealander of European descent) or 'Tauiwi' (non-Māori, colonist), creative engagement with Māori materials, worldviews and language during this project was acknowledged through the use of indigenous terminology. Māori language specialist John Moorfield and Te Aka Māori Dictionary guided the following definitions. 'Mana Whenua' (power associated with possession and occupation of tribal land), 'and 'Taonga' (socially or culturally valuable objects, resources, phenomenon, ideas and techniques).

10. The 'Māori-Pākehā' or 'Māori-Tauiwi' hyphen draws attention to the evolving relationship and space for ethically collaborative learning between cultures (Jones and Jenkins, 2014).

11. Te Kawerau ā Maki are the designated iwi or tangata whenua (local indigenous people) of the specific area that this project takes place in Tāmaki Makaurau, Auckland, whilst acknowledging that AUT city campus resides on the whenua of Ngāti Whātua Ōrakei.

Anthropology, textiles and basketry specialist Stephanie Bunn (2020) highlights how the experience of a bird in flight is parallel to the experience of weaving a basket. This metaphor has been a guide as a visual language of images throughout this project.

> "the materials on a flight around the centre-point of action, swooping and diving around the maker...the beating heart of the bird launches itself into swoops and dives of flight...in their active engagement both basket-weaver and bird are putting all their force and attention into the activity... the movement of the weaver with their materials is light, fragile, flexible, yet the tension of their engagement together, which makes the basket take form, gives it strength...it has come into being through a sweeping movement of human hand, and materials... the bird in flight, also something light yet strong, with wings, which are flexible yet tense...comes into being through movement, a bird, its wings and a current of air, and that is its flight."
>
> (Weaving and flying: fusion, friction and flow in collaborative textile research, p.138–139)

Chapter one: *taking off*

1.1 Introduction

At the start of this research, I developed a mind map to establish the non-negotiable aspects of the project. I envisioned four critical concepts to guide my work. Firstly, my research would use local, foraged materials including fresh "living" plant materials like harakeke (New Zealand flax, phormium tenax), and "discarded" materials and leaves that had fallen to the ground. Secondly, I intended to use these local foraged materials to create sculptural hybrid items that were functional and aesthetically appealing, leveraging the natural characteristics of materials to add visual interest and value to their form. These sculptural forms would highlight repetition of movement, mesmerizing rhythms of complementary colours, contrasting lines, and fibrous textures. Thirdly, my research would involve a significant amount of hands-on making, experimenting with methods of making and documentation, and employing allied textile-basketry techniques such as weaving, twining, plaiting, and braiding. This making would include two-and three-dimensional forms as site-specific responses. Finally, I intended the research to culminate in learning, sharing, or donating through spaces within the community. These critical concepts remain core to my research. Ultimately, this project intends to emphasize my position as a "maker" within creative textile practice and an evolved perspective regarding the potential of plant materials in textile design. In engaging with weaving and harakeke from the cultural position of tauiwi, it is important to acknowledge indigenous worldviews within Aotearoa. The practice-led research aims to engage with plant species' changing physical and aesthetic properties, create a collection of temporary plant-based textile structures, and communicate research through accessible, nontechnical, visually descriptive language. What can be uncovered through a hands-on introspective textile creative practice, working with plants in an ecologically local context? This space of enquiry around textiles and design gains valuable dialogue by highlighting the role of plants as co-designer within creative-making processes and celebrating the dynamic movements that emerge through practice-led research.

Thesis Structure

Chapter One provides a background to the project through positioning the experiences at Kaipatiki and a Northcote residence which were both critical to its realisation. Chapter Two delves into research contexts, exploring concepts and work associated with human gestures, ecological wellbeing, knowledge systems, and plant-based textiles. Chapter Three introduces the methodological approach adopted for the project before detailing key research methods. Observational engagement and caretaking practices during fieldwork are addressed alongside a discussion of how materials guided prototyping, highlighting the ongoing, evolving connections made through visual documentation and hands-on learning. Chapter Four documents the practice and presents findings and reflections. It examines the relationship between AUT North and harakeke on-site as an evolving ecology, and the trajectory of experimental textile prototypes, delving into physical and aesthetic transformations within harakeke and sculptural practice. Chapter Five provides critical reflections on the project's outcomes, summarizing key findings and limitations of the work and identifying areas for potential development and future research.

1.2 Background to the project

The text below emphasises the critical role of the local landscape for tacit learning experiences and the role of plants as a guide for intuitive, materials-driven textile explorations.

In modern society, there is a growing awareness of environmental and ecological concerns, resulting in a more ethical approach to the life cycle of materials. Paul (2019) argues that textiles made from plant-based fibres are taking on a central role in conversations about sustainability. One reason they are gaining momentum is their appealing physical and aesthetic qualities, degrading over a shorter period, and promoting temporary uses and applications. Authors Rickard and Cox (1984) explain that historically, indigenous peoples used plants in their local surroundings to create a wide range of valuable, functional items and structures. This approach to making 'technical textiles' is ecologically and financially viable and helps ensure that materials are not overused.

Although technical textiles such as agrotextiles are often associated with larger-scale commercial trade and business (Paul, 2019), this project questions whether this must be the case. Site visits to the Agricultural and Pastoral Show, North Shore Home and Garden Show, and Fieldays at Mystery Creek in Hamilton, highlighted the potential for custom-made, community-based, not-for-profit models. How can plant-based materials be mindfully used to create temporary experimental textiles that support the local environment and community?

Roles of green spaces: what sites are suitable for experimental textile research?

Fieldwork was crucial to this research project. Exploration of urban forests, backyard gardens, and institutional landscapes as potential sites for textile experimentation was key, alongside checking site permission. AUT North campus emerged as a suitable site for the latter phases of the research and was a core part of the creative practice. A summary of the findings for each local ecology follows

1.3 Discovering the ecologically local

Site One: Kaipatiki – urban bush regeneration

The research began by volunteering at Kaipatiki Project, an eco-hub in Birkdale, close to my Northcote residence. I got more involved in the community and gained knowledge surrounding education for sustainability, tidying the nursery on-site every week and removing unwanted plant species from Eskdale Reserve (figures 2-5). I gained a clearer understanding of Kaipatiki and the organization's overarching goals. The following reflection captures my experience:

> *As part of the group of volunteers, we removed Chinese privet (ligustrum sinense) along the edge of the path, using the identification skills we had just practiced, but for a different plant species. It is invasive and strangles the growth of other nearby plants. As we trimmed back the long, thin, flexible branches and foliage, we cut it into smaller bits and scattered them on the soil, covering the surrounding ground. Upon returning to the site later in the afternoon, I retraced my steps and found privet cuttings sitting along the trail in the reserve. While cutting and handling the plant was relatively easy, issues emerged when attempting to bend and weave its long, thin, and flexible branches during the making process. It quickly became apparent that the physical properties of the plant were incompatible with the textile-basketry techniques I had planned to use in prototyping; therefore, privet was not a viable material within the project context. As a result, I relocated to a Northcote residence and established a backyard garden as a new workspace while searching for a different site to complete fieldwork and prototyping. The plant materials were steering the research.*

Figure 2. Volunteering session, 27.09.2023, Eskdale Reserve.

Figure 3. Volunteering session cutting down Chinese privet (ligustrum sinense) 11.10.2023, Eskdale Reserve.

Figure 4. Teaching garden, 08.09.2023, Kaipatiki Project Eco Hub.

Figure 5. Teaching garden and nursery, 30.08.2023, Kaipatiki Project Eco Hub.

A key observation I picked up while volunteering was the problematic use of terms, specifically ‘pest’ and ‘invasive species.’ Based on personal experience, all non-natives seemed to be referred to negatively at Kaipatiki; but could the value of these non-native species be reassigned? Even if a plant is not indigenous to Aotearoa New Zealand, it can still have function and appeal (Merfield, 2022). From the perspective of a bird species, it could be providing a safe habitat within the sheltered structure of its branches and leaves, or it could be helping plant species weather the environmental elements, diffusing shade onto vulnerable crops growing below, ensuring the soil does not dry out during the peak of summer.

Site Two: Northcote residence – backyard work

In the backyard of my home in Northcote, I set up a mini test site to experiment with planting and textile-making. Privet was identified on the property and cut down; the stem and branches became posts in the garden spot (figure 11). Caring for plant seedlings gathered at Kaipatiki's homegrown food workshop and nurturing them into mature plants, was challenging (figure 6). I gathered tī kōuka (cabbage tree, cordyline australis) and harakeke (New Zealand flax, phormium tenax) leaves and created several plant-based textile structures, which proved to be labour intensive and time consuming (figures 7-9). The process of making underscored the significance of rapid, larger scale production, as it allows for valuable feedback and emphasizes the minimal ‘cost’ of a prototype in relation to its longer ‘service’ time. To test the biodegradability of plant material, I buried several harakeke textiles in the soil (figure 10). However, the focus and documentation of this trajectory was stopped, as an essential part of textile structures in this project is the visual presence of the plants' aesthetic qualities.

Figure 6. Attempts at nurturing seedlings from Kaipatiki's homegrown food workshop into growing plants, 08.09.2023, Northcote.

Figure 7. Tī kōuka (cabbage tree, cordyline australis) textile prototype protecting ripening strawberries from curious birds, 24.11.2023, Northcote.

Figure 8. In-progress textile prototyping with tī kōuka (cabbage tree, cordyline australis), 10.10.2023, Northcote.

Figure 9. Labour intensive and time consuming twined textile prototype, 14.12.2023, harakeke (New Zealand flax, phormium tenax), Northcote.

Figure 10. Testing biodegradability of harakeke (New Zealand flax, phormium tenax) textile prototypes, 29.11.2023, Northcote.

Figure 11. Utilizing Chinese privet (ligustrum sinense) branches as support posts in the garden box, 16.11.2023, Northcote.

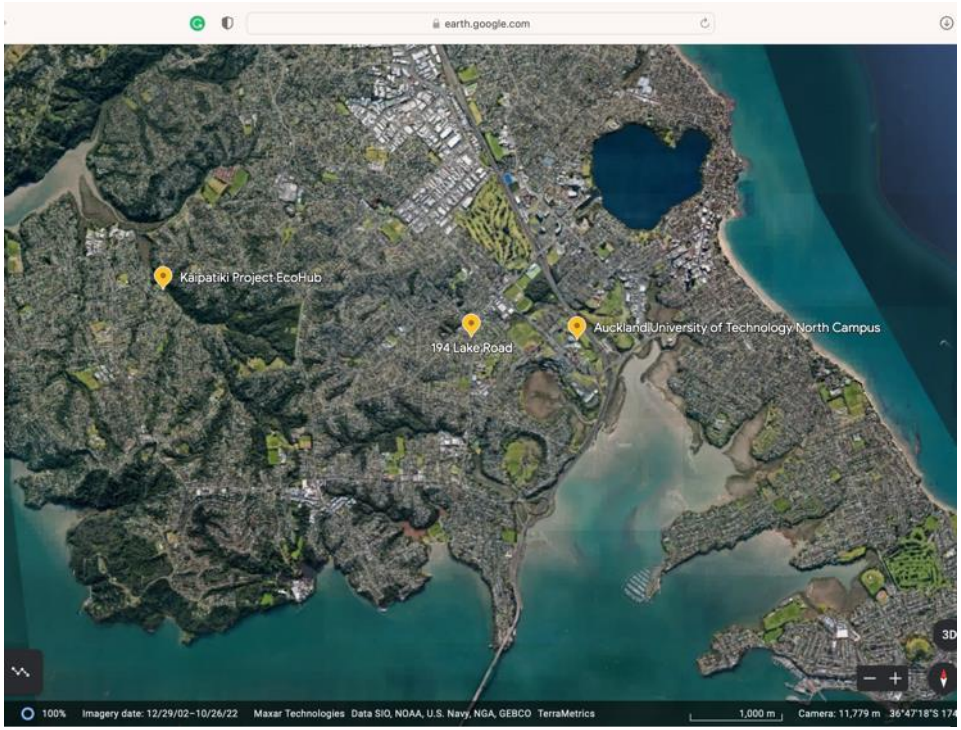


Figure 12. Google Earth screenshot showing local ecologies, Kaipatiki Project Eco Hub, Northcote residence, and AUT North Campus in relation to one another, 17.05.2023.

1.4 Realization of project: "ahaa" moment

As the research progressed, further fieldwork was needed to identify a local site that could be accessed by community as well as support a textiles making practice and allow for on-site examination. After visiting a small community garden on the roof of an AUT city campus building, it became evident that easy access to plant material for making prototypes was essential--the roof top garden was unsuitable--however this visit sparked the realization that there were other green spaces associated with the university. AUT's North campus on Akoranga Drive, Northcote, stood out as an ideal local ecology for the project due to its proximity to my residence and the existing connections I had with the site (figure 12), such as it being a passageway for public transport. Moreover, the green space at North campus is accessible to anyone, adding to its appeal.

Figure 13. Community garden area housing fresh fruit, vegetables and herbs, 13.01.2023, AUT North.

Figure 14. Boardwalk area housing native plant species, 18.02.2023, AUT North.

1.5 Parameters of AUT North

Observations during initial site visits soon led to intentions for the space. A range of experimental plant-based textile structures would be implemented within two different areas of the site; the raised community garden bed area, which houses fruit, vegetables and herbs (figure 13), and the plants adjacent to the boardwalk, which houses numerous native species (figure 14). A couple of hundred metres separates these two areas, yet each is distinct, especially in how they weather the elements. A discussion with a grounds staff member working at AUT North revealed that the native boardwalk area had been problematic. Numerous plants had been struggling with the high volumes of water pooling in the area and, as a result, were showing signs of stress; leaves that were initially shades of green upon planting were now closer to orangey-brown tones. Some plants had been so overwhelmed by the weather conditions that they died. These have since been removed, leaving empty wooden posts scattered around the boardwalk area, waiting for new native plants. This area needed more support than the community garden so it became the sole focus for the latter part of the research project. A snapshot of the contemporary narrative surrounding plants is evident in the following excerpt.

Figure 15. Inspecting the leaves of boardwalk plant species, 20.01.2023, AUT North.

Wandering through the AUT North campus, I notice an eclectic mix of colour, pattern, texture, depth, scale, volume, shape, line, space, balance, movement, repetition, and contrast. The boardwalk has various plant species, and I feel compelled to explore this new space as I see the sunlight shining through a canopy of leaves, creating pockets of light and highlighting the foliage and surrounding soil. As I walk towards this area, I feel the strands of overgrown grass brushing against my legs and ankles. The grass has grown energetically and chaotically upwards, creating a sense of wildness even though it is a maintained environment. While looking at numerous plants, it becomes evident that some leaves are decaying, or damaged and need removing. As I tend to one of them, I notice tiny, friendly creatures crawling onto my hand, ladybugs tickling my skin with their little legs, and other species, fantails, moving closer to investigate the new movement in the space, driven by curiosity. I lift the greenery of the plants, closely inspecting and examining the stalks, leaves, and stems (figure 15); worms and ants moving around below, exploring the damp soil. I see shadows falling onto the natives, the big trees defining the edge of campus with their mighty and gentle form.

An aerial map of AUT North provides a comprehensive view of where harakeke is located, serving as a general guide to the scattered groupings found throughout the site. Some plants are too small to be harvested without hindering their growth, while others are fully matured, boasting tall leaves and requiring human care and maintenance (figure 16). The number of plants in these clusters remains unknown due to their close proximity. To emphasize their relationship within the ecosystem, the harakeke harvest site and the boardwalk area are visually distinguished on the map in different colours (figure 17).

Figure 16. Harakeke plant (New Zealand flax, phormium tenax), 18.02.2023, AUT North.

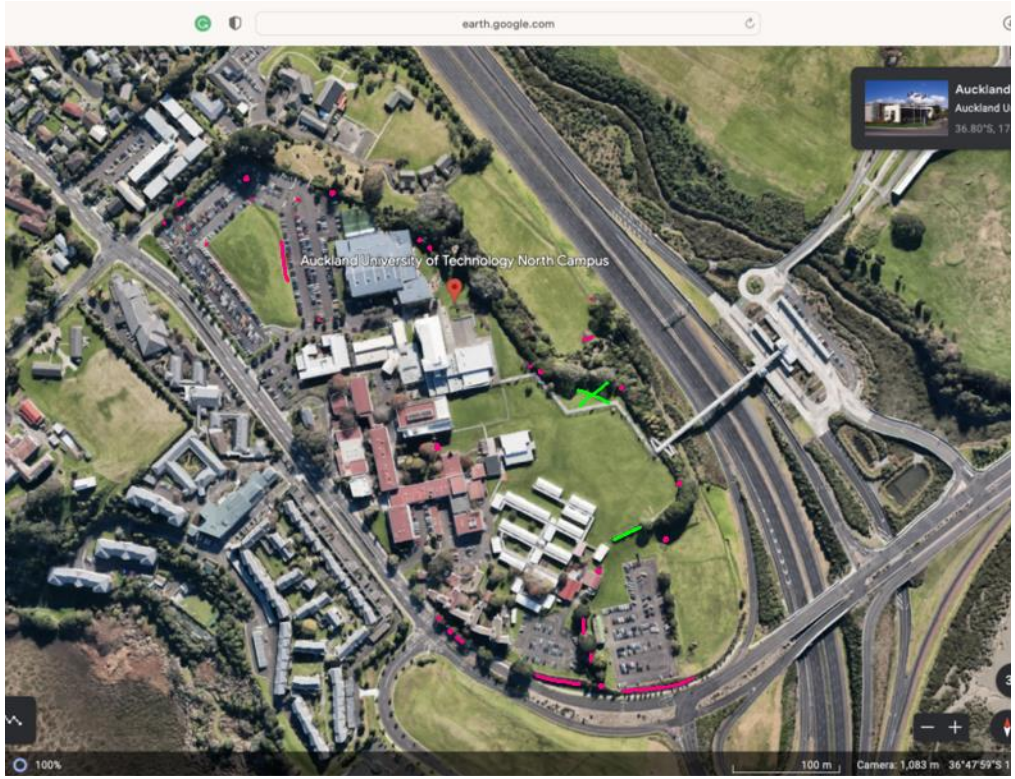


Figure 17. Google Earth screenshot/drawing showing harakeke plants (pink), harvest site (green) and their relation to the boardwalk area (green cross) 17.05.2023, AUT North.

While working between Kaipatiki and AUT North, I noticed a visible difference in the composition of plants in each area. In Kaipatiki, intimate groupings of plant species created a dense canopy of foliage. Individual plants were spaced far apart in the institutional landscape of AUT North, with clear space to walk between. These green spaces are ideal sites for short-term creative exploration as they offer accessible, low-risk learning opportunities that contribute positively to environmental efforts and the community. There are numerous advantages to working within these sites. Their value increases if an individual is already local to the area. Additionally, they are publicly accessible, meaning undertaking projects and observing work is straightforward. Academics Mazzola and Liuti (2018) examine how the timeframe of temporary experimental work reduces long-term negative consequences for surrounding species and ecosystems. Short-term projects in green spaces allow for deeper exploration of sustainable practices and enables valuable opportunities to apply knowledge, skills and learnings.

This research is site-specific; practical work is completed outside exposed to rain, sunshine, and wind. External factors within the last six months were severe windy weather and ongoing flooding. These weather-related events significantly hindered the project's development, specifically at AUT North. The amount of time spent working on-site drastically reduced, and as an extension, the amount of making was limited. Dynamic connections emerge between site-specific work in public spaces, the roles of place, and the viewers' experience. As art history educator Kwon discusses, creative practitioners who place objects or work in non-neutral settings are challenging the conventional exhibition norms (2002). This research project questions these ideas as Māori notions of site and whenua (land) are engaged through implementation of textile prototypes in outdoor locations which have significant history and presence of Mana Whenua. Authors Riley (2004), and Awekotuku, Campbell, Pohio et al. (2021) discuss tikanga (best practice) protocols regarding harvesting plant material harakeke, and how they are guided by logic. Cutting only the larger more mature leaves, at a downward angle towards the ground, and in fine, dry weather minimizes damage to the plant. It prevents moisture from accumulating at the base, reducing the chance of rot. Respecting and caring for the plant promotes its ongoing use and availability for future generations.

1.6 Harakeke as 'meeting point': situated in Aotearoa through choice of material

In his renowned 1926 paper, The Māori Craft of Netting, anthropologist and author, Rangi Hiroa (Sir Peter Buck) of Ngāti Mutunga, demonstrated that communities in early Aotearoa had a deep, emotional connection with whenua (land). Local plant materials were used to create functional items such as clothes (rain capes), storage (kete or basket), and tools (fishing rope). As author Pendergrast (2005) states, harakeke leaves contain strong supple fibres and are highly compatible with various Māori raranga making techniques such as weaving, plaiting, braiding, and twining. These practices are still valuable and viable today (Riley, 2004; Chitham, Māhina-Tuai, and Skinner, 2019), as illustrated by contemporary woven works of Matthew McIntyre-Wilson, Donna Campbell, Ruth Castle, Maureen Lander, Nikau Hindin, Rowan Panther, Anne Daniels, and Kiri Nathan. Birgit Moffatt's work was particularly impactful, as her rapid design iterations fostered intuitive connections with harakeke (New Zealand flax, phormium tenax) material and weaving techniques (figures 20-22). Additionally, Donna Campbell's influential creative practice positioned sculptural textile structures around bodily forms, encompassing and reframing the space (figures 18-19). In the context of this project, sculptural prototype ideas exhibited a similar pattern to Moffatt. During daily walks my mind would often wander, allowing me to observe natural forms, colours, shadows, and textures in my surroundings. These observations guided sketches for potential textile structures. Additionally, elements of Campbell's work are comparable with this research. However, the sculptural textile structures I developed serve a distinct purpose of supporting, protecting, and encircling the area around native plant species. In 2016 (January 1st), the New Zealand Herald reported on harakeke items that addressed real world issues, meeting specific demands. One item is the wahakura, a bassinet designed to reduce the number of infant deaths while sleeping. Another New Zealand Herald article in 2018 (Treacher, May 28th) highlighted the significance of waka tūpāpaku or waka kawe, coffins or caskets, supporting indigenous cultural values and burial practices. Scion, a research establishment in Rotorua is currently developing products made from harakeke because of its unique connection to the landscape (Were, 2018).

Figure 18. Donna Campbell, *Embodied Mana Wahine: Murirangawhenua,* 2018, harakeke (New Zealand flax, phormium tenax), Ramp Gallery, https://rampgallery.co.nz/exhibitions/kura-embodied/.

Figure 19. Donna Campbell, *Embodied Mana Wahine,* 2018, harakeke (New Zealand flax, phormium tenax), Ramp Gallery, https://rampgallery.co.nz/exhibitions/kura-embodied/.

A version of tikanga was observed throughout the project. Māori worldviews framed the approach, and the landscape served as a reminder to acknowledge the emotional and holistic connection between living species. In the chapter from "Design and Nature: A Partnership," creative practitioners and authors Kane, Smith, Te Kanawa, et al. (2019) demonstrate how harakeke has become an accessible meeting point for new learnings and knowledge to thrive holistically amidst change. Such diverse, collaborative, collective knowledge should be valued and the taxonomic structure revised to include indigenous perspectives (Gillman and Wright, 2020). Harakeke was selected for this project because of its versatility and hands-on potential, offering multifaceted connections, unlike any other material. Its functional qualities, along with its ability to foster relationships between people and whenua, make it a valuable and relevant reference in Aotearoa.

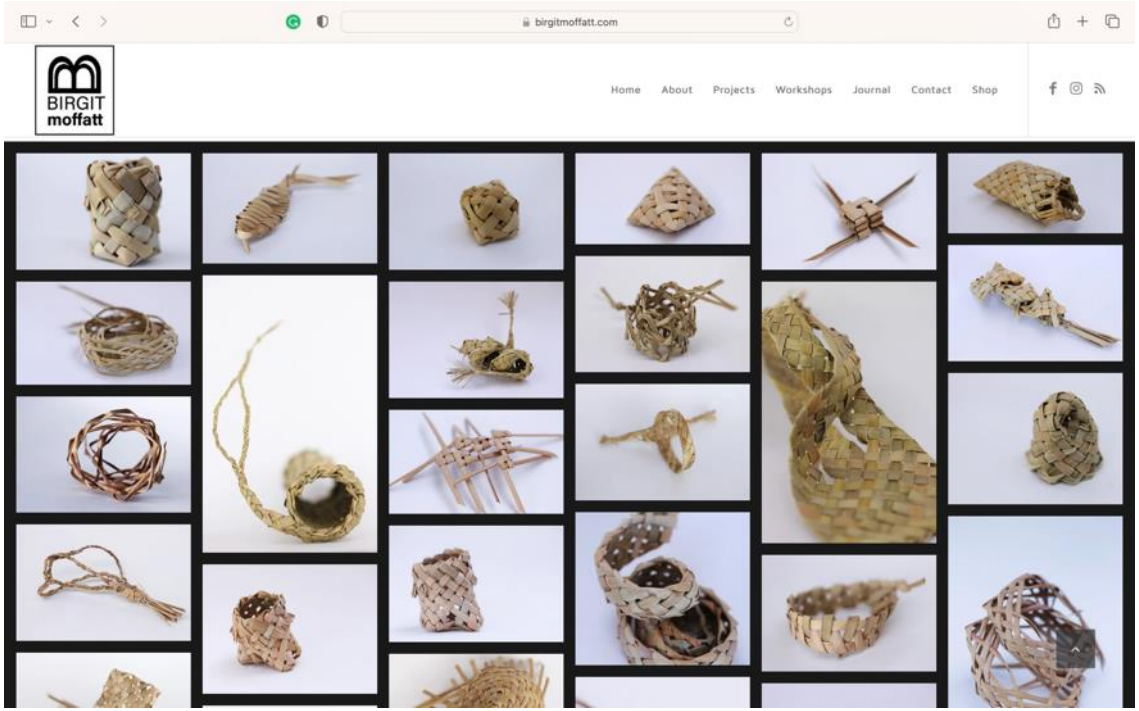


Figure 20. Birgit Moffatt, *100-day project,* website screenshot, 2018, https://www.birgitmoffatt.com/projects/100-days-project-2018/.

Figure 21. Birgit Moffatt, *100-day project*, prototype # 20, 2018, https://www.birgitmoffatt.com/projects/100-days-project-2018/.

Figure 22. Birgit Moffatt, *100-day project*, prototype # 24, 2018, https://www.birgitmoffatt.com/projects/100-days-project-2018/.

Chapter two: *manoeuvring*

2.1 Literature review

"Every species needs its allies and protectors"

– Kimmerer, *Braiding Sweetgrass* (2013, p.151)

The literature review provides contextual and theoretical framing for this research, connecting practitioners and ideas within ecology, education and textiles. Specifically, it positions environmental perspectives, hybridised knowledge and human gestures within ecologically local sites as critical driving forces for experimentation. Key topics discussed include: acts of disturbance, care, and observation; ecological conservation, restoration, and wellbeing; increasing appeal and application of plant-based textiles.

2.2 Acts of disturbance, care and observation

Green spaces inspire creative and reflective thought, making them prime locations for experimentation. Landscape architecture and urban design firm partners Lord, Wylie, and Girolamo (2019) demonstrate that by being present in an area, localised insights and knowledge emerge, allowing for active involvement and adaptability to the surroundings. Humans often focus on damage, longing, neglect, tension and loss within a garden. They feel responsible for species and habitats, putting time and effort into keeping them alive, reducing negative impact or harm, and promoting maturity and growth (Bayes, 2023). Scientist, author and decorated professor Kimmerer (2013) proposes tending, harvesting and foraging as examples of disturbance, encompassing a series of caring, observant bodily rhythms. These acts require patience and are passive and slow. Working in a garden space is physical, resulting in sore muscles and tired, aching bodies at the end of the day. Essay contributors Lively, Slater, Kincaid, et al. (2021) confirm these spaces remain in a state of boundless transformation or transition, moving, craving and waiting. Academics Vannini, Waskul, Gottschalk, et al. (2012) explain that weather is similar in that it fluctuates dynamically and other species have to adjust their routines and behaviour in response.

Sometimes, the work and effort put into green spaces are foiled so accepting external factors of unexpected weather events and human-driven disruptions is vital. Drawing from the discussion above, this research fosters the emergence of mutually supportive relationships in whenua through dynamic and nurturing human gestures towards plants. Additionally, care and maintenance are ongoing, actively guided by and adapted to the changing environmental surroundings.

2.3 Ecological conservation, restoration, and wellbeing

Conservation initiatives and volunteer labour in Aotearoa New Zealand were investigated by authors Heimann and Medvecky (2022). They found that residents living within a ten-kilometre radius of a conservation site are more likely to volunteer than those living beyond, and they see it as a valuable way to contribute to and connect with their community. Human disturbance contributes to volunteering practices, but how are these experiences valuable?

Lord, Wylie, and Girolamo (2019) propose that green spaces offer opportunities for meaningful engagement and experimentation. At the Kuku Estuary, Horowhenua, applications of biochar for ecological wellbeing are currently in progress. Creative practitioner and academic Monique Jansen leads the collaborative Tauiwi-Māori project and partners with Huhana Smith, of Ngāti Tukorehe (Mana Whenua). Workflows were documented via blog posts between April 2021 and December 2022. Dry branches gathered on-site were burned in a specially designed kiln, creating carbon-rich charcoal material biochar. Biochar-filled sacks placed in the Waikōkopu Stream filtered contaminants and sedimentary runoff (figure 23). In the middle of the project timeline, lengths of biochar-stencilled weed mats offered additional support for the waterway, promoting future opportunities for planting natives. A subsequent exhibition of work showcased the project's progress through visual documentation, displaying biochar-related items and rolls of the stencilled mat, which awaited their return and functional implementation at Kuku. Ongoing surveillance and evaluation on-site suggest the biochar products are effective in their intended functions and may have further practical uses.

Ecological restoration and monitoring are also taking place at Ōkahu Bay in Auckland. Academic researchers Walker, Wehi, Nelson, et al. (2019) discuss numerous collaborative projects currently underway that focus on the overall wellbeing of the waterway. These projects were initiated approximately ten years ago. Te Kawerau ā Maki (tangata whenua) weavers harvested harakeke fibre near the site, skilfully turning them into twenty-five-metre taura (ropes). Author Jacobson explains in a 2017 (October 8th) Stuff article that divers secured these mussel-filled textile structure lengths vertically within the bay and monitored them, testing mussels' water-filtering capability to support aquatic species and habitats (figure 25).

In another part of Aotearoa at Te Arawa Lakes, site-specific experiments are underway combining indigenous Māori knowledge and contemporary scientific methods (figure 24). A 2023 article by Heritage New Zealand, (Partsch, February 1st) and a 2022 article in Scoop Independent News (February 23rd) explain how the project began with Te Arawa (mana whenua) weavers creating large harakeke mats (uwhi) in a plain weave (one-over, one-under pattern structure) which were then secured to the bottom of several lakes in Rotorua to restrict the growth of undesirable species and promote kōrua (crayfish). Local divers and weavers required technical knowledge, patience, and focus to perform their tasks, continually adjusting to their surroundings. Two additional lakes offered different water conditions for the experiment, however, further testing is needed to confirm uwhi's viability for ecological management, specifically in small-flowing channels of water that connect to lakes. In a Stuff article, author Bathgate (2021, December 1st) outlines that a growing number of communities in Australasia are interested in holistic approaches towards controlling and managing waterway ecologies. Kuku Biochar, Te Arawa Lakes, and Ōkahu Bay connect with my research project as they use textile structures within ecological contexts to provide functional benefits and support other living species. They foster local engagement and learning and showcase a commitment to environmental wellbeing, indigenous plant materials and holistic knowledge.

Figure 23. Monique Jansen, *kuku biochar project,* sacks placed in Waikōkopu stream, 2022, https://www.drawingopen.com/blog/2022/9/11/the-kuku-biochar-project-july-2022.

Figure 25. Adam Jacobson, *Ōkahu Bay project*: mussel taura (ropes) and divers, 2021, https://www.stuff.co.nz/auckland/local-news/central-leader/95558972/mussel-laden-ropes-aim-to-restore-okahu-bay-shellfish-beds.

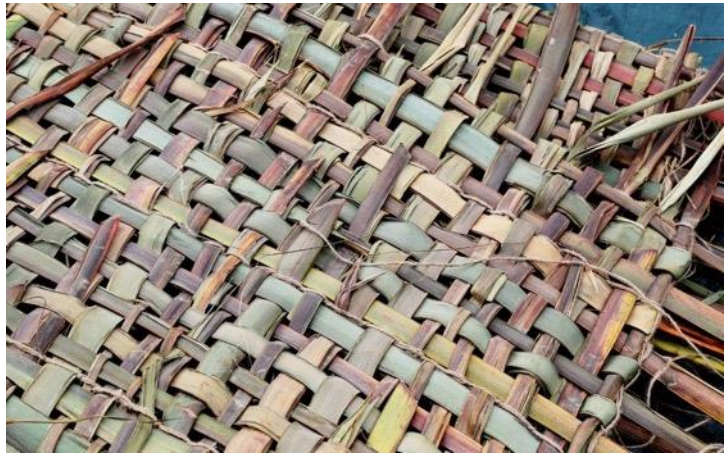


Figure 24. Mark Taylor, *Te Arawa Lakes project*: harakeke uwhi (mats) in a plain weave pattern structure, 2017, https://www.stuff.co.nz/national/127139749/diving-into-mtauranga-mori-to-find-an-800yearold-solution-for-70yearold-problem.

2.4 Appeal and application of plant-based textiles

Plant-based textiles are increasingly significant in commercial industries such as agriculture and horticulture. Paul (2019) argues that the application and appeal of natural fibres are also expanding within contemporary agrotextiles. Woven, knitted, and nonwoven textiles support particular plant species, each structure offering unique visual and physical qualities. Academic researchers Miao, Pierlot, Millington et al. (2013) build on this discussion of natural fibres, explaining how mulch mats are a form of agrotextile implemented around the base of plant species, which restricts the growth of competing, unwanted plants by limiting access to sunlight, nutrients, and water. These fibres have increasing potential as mulch materials as they degrade in response to the environment, gradually returning nutrients to the soil. Synthetic materials are also used as mulch to help support plant species. However, their disposal is problematic as textile fragments get lost in the ground, contributing to pollution.

While plant fibres offer potential in environmental management, they inevitably deteriorate so their usage is over a shorter timeframe. Authors Rickard and Cox (1984) discuss how poro (umbrellas) made from pandanus, function as a protective shelter from extreme weather conditions for approximately twelve months. Minimal physical effort and time are needed to transform them into other items, therefore adding to the value, but how often do temporary textile forms need to be replaced? Approaching making with consideration for the whole life cycle (of product or material) is discussed by academics Mazzola and Liuti (2018). They propose that intentionally short-term, three-dimensional textile structures are valuable because they have a low environmental impact, cost and are adaptable. Construction and deconstruction are relatively straightforward; the maker utilizes a variety of technical skills, ensuring prompt design decisions in response to changes in fabric properties and/or the weather. Does the location of short-term textile structures influence the choice of ethical, available, and practical material used? Can transformations within textile materials offer value and guidance to experimentation? Author Keune (2017) discusses plants as co-creators within making, explaining how corn seeds were knitted into textile structures. The controlled process of watering awakened growth qualities within the textile; however, stopping this process

accelerated the decay rate. This observation raises the question, can a plant material's physical and aesthetic transformations be incorporated into the design? Can contemporary textile-based practice actively promote states of change?

Textiles and basketry often utilize living materials and hands-on making processes. Within this context, author Pendergrast (2005) delves into the cultural significance of Māori raranga and indigenous materials such as harakeke (New Zealand flax, phormium tenax). His book contains diverse information, including diagrams and photographs of various fibre techniques weaving, plaiting, braiding, twining/miro (twisted cord, fibre, thread), knotting, tāniko (finger woven border for cloaks), and netting. These visuals complement the detailed written explanations and portray the transformation of plant fibres into practical items such as kete (baskets), kupenga (fishing nets), and kākahu (cloak, clothing). In Aotearoa New Zealand, kete take shape through the skilful manipulation of supple, malleable plant fibres into a distinctive plain weave, one-over, one-under structure (see figures 22, 24). As the making process unfolds, the form of the vessel evolves. It starts as a flat, two-dimensional surface; however, the corners and sides gradually take shape through the systematic crossing of material strands, forming an 'X' pattern as they interlace upwards from the ground.

The above discussion highlights plant-based textile structures' temporary characteristics; natural degradation, responsiveness to environmental elements, readily modified or dismantled in response to changing needs or preferences, make them versatile and adaptable throughout their lifecycle. This research is grounded in the temporary nature of plants as materials.

Chapter three: *stabilizing*

Creative practice-led research was employed to explore the aims of the project. The term 'practice-led' is a method commonly used in creative fields like art and design. As outlined by contemporary artists and researchers Mäkelä and Aktaş (2022), the practitioner's subjective experience and embedded knowledge is positioned within an academic context, thereby fostering critical and self-reflective discourse. This method aligns well with materials-driven experimentation in textile-based practices, as insights emerge through hands-on making and documentation processes.

3.1 Methodology

I framed this research within the context of Māori worldviews, recognizing whenua (land) as a living being. However, ethical consideration was taken due to my cultural positioning as non-Māori, and the focus on harakeke, an indigenous taonga plant. As Pākeha author Jones, and Māori author Jenkins of Ngati Porou (2018) explain, the notion of the hyphenated space is a suggestion for those who identify as Tauiwi/Pākehā to respectfully interact and work with Māori concepts, spaces and materials. According to academic Myers (2018) and author Merfield (2022), plants species offer valuable insights into an evolving world. They are crucial to life on earth as they mitigate climate change and foster intimate connections and relationships between species. To 'breathe' harmoniously alongside other species during this project, I honoured tikanga (customs) associated with harvesting harakeke. This practice reveals a deep understanding and care for plant materials, especially evident in raranga (weaving). Local ecologies were a valuable foundation for nurturing textile-design-driven experiments with plants. Educators and researchers Ford and Blenkinsop (2018) propose that an open curiosity and mindful intention enable exploration. Local ecologies have a nuanced and intricate language of their own, yet communication can still occur. I delved into creative practice-led research, actively engaging with and listening to, creating an environmental tone of voice. Site visit reflections utilized visually descriptive writing styles to 'capture' the landscapes' essence and

perspective. My understanding of the ecology deepened through observation and awareness, allowing me to engage more meaningfully as the project progressed.

3.2 Research Methods

Hands-on, introspective methods were adopted for this research enabling in-depth, visually descriptive narratives to emerge. Textile explorations throughout the research phases focused on highlighting colour, pattern, texture, depth, scale, volume, shape, line, space, balance, movement, repetition, and contrast within the making. Micro-reflection and analysis methods supported the overall practice and enabled deeper explorations and connections. The physical outcomes of this project are a collection of textile structures, however they are the by-products of the research, not the driving force. The value of this research lies within the process, highlighting learnings, knowledge and understanding regarding plant species as materials and the nurturing of ecologically local, mutually supportive partnerships. Essential methods included:

- Fieldwork; engaging with local ecologies and plant materials; framing the concept of value as site-specific; being resourceful, versatile and responsive to surroundings; acknowledging existing work, structures and species within the space; responding to weather and needs within site.

- Prototyping; approaching making from a materials level, seeing how plant fibres behave and then adjusting, understanding how changing physical and aesthetic properties of plant species are valuable in the creative process.

- Documentation and reflection; taking photos, making observations, brainstorming, keeping a visual diary of notes and drawings, and mood boarding; collating relevant information in a digital platform, reflecting on experiences, seeing how each fit together.

Figure 26. Fieldwork notes in visual diary: noting time, date, movement between plant species in the boardwalk area, 30.03.2023, AUT North.

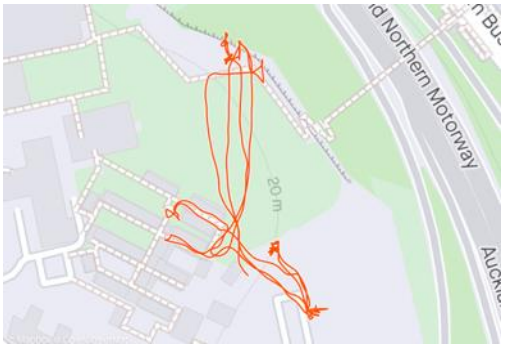


Figure 27. Movement tracking, emerging paths and hot spots during field work in boardwalk area, 30.03.2023, AUT North.

3.3 Fieldwork: observational engagement and caretaking

A crucial component of the project was fieldwork. I selected ecologies near my home in Northcote and maintained a physical visual diary throughout fieldwork, documenting structured parameters, environmental conditions, weather, timings, as well as order of movement between plant species (figure 26). To capture the dynamic nature of the sites, I utilized tracking techniques via video and timelapse, which allowed me to record active movement paths and areas of static activity (figure 27). For instance, I observed myself transitioning between different bodily positions, such as carrying a bundle of harakeke material to a specific plant, crouching to write notes in my diary, and then standing up to stretch my tired limbs. As academics Fletcher, St Pierre, and Tham (2019) noted, these positions can represent a spectrum of experiences and engagements. These repeated sets of motions serve as creative conduits for interaction and response regarding the surrounding environment, facilitating knowledge acquisition through physical engagement (Ingold, 2010). While walking combines action and thought in a parallel manner, my project focused instead on active crouching. Stances were adjusted to alleviate muscle fatigue or soreness, prioritising upper body, arm, and hand movements. I engaged with the environment through hands-on learning.

Figure 28. Tending to the overgrowing harakeke (New Zealand flax, phormium tenax) plant by removing dead leaves and harvesting material in preparation for making, 20.02.2023, AUT North.

Figure 29. Dried harakeke leaves chopped into mulch, gloves minimise the impact on hands but limit skin interaction, 30.03.2023, AUT North.

During fieldwork, I anticipated exposure to changing environmental elements. My relationship between the weather and making has been under negotiation through the project; challenges including severe, ongoing flooding, hindered the completion of fieldwork, harakeke harvesting, and on-site prototype development. The native boardwalk area was already prone to water pooling, and these events highlighted its vulnerability to rainy conditions. Plant materials played a guiding role in my decision-making throughout the project. For instance, I selected privet in Eskdale Reserve near Kaipatiki, tī kōuka around the Lake Road residence, and harakeke at AUT North as abundant and accessible materials to create prototypes. Another example of guidance is the selected work areas within the site. During initial visits to AUT North, I observed numerous groupings of harakeke around the grounds, providing ample material for potential experimentation. These plants required maintenance; a dense, tall, overgrowing, crowded mass of mature leaves bending around one another, claiming space around the plant. As scientist, author and decorated professor Kimmerer (2013) states, certain plants thrive with human intervention. I engaged in fieldwork to tend, harvest, forage, and closely observe the established native plants, focusing on the boardwalk area and a cluster of harakeke across the field (figure 28). In my approach, I utilized entire harakeke leaves in their original harvested form, occasionally bearing traces of dirt and debris from the surrounding environment. Actively maintaining and tending to the established plants during fieldwork allowed elements of human disturbance to emerge.

3.4 Prototyping: materials driven making as a form of education

Creating temporary textile structures through prototyping played a significant role in exploring plant materials' evolving physical and aesthetic properties. The prototypes embody this temporary nature, as they age and degrade over time, requiring minimal effort to dismantle and remove from site. I began prototyping by foraging for plant materials in the local area, gathering unwanted materials from the ground or harvesting from plants. However, focus shifted to harakeke for the core practice at AUT North. Throughout the making processes I relied on my hands as the primary tool, recognising the significance of the skin's interaction with the material (figure 29). As discussed by design and textile researchers Niedderer and Townsend (2022), this kind of tactile engagement provides valuable sensory information. These dynamic interactions, and the resulting prototypes, become a conduit for the sharing and reciprocating of practical and theoretical knowledge, bridging the maker and the material.

I actively used gloves to protect my hands during intensive handling of plant leaves. While this reduced the strain caused by repetitive movements, it also limited the skin-to-material contact. The physicality and time-consuming nature became apparent during earlier prototyping, exposing limitations in terms of the amount of making that could be done without consequence. My body retains a memory of the experience, particularly in the forearm, wrist, hands, and fingers. Using plants to make textile structures emphasized the distinctive characteristics of the material. Harakeke exhibited diverse textures, colours, and weights, contributing to a visually dynamic aesthetic. The freshly harvested leaves, vibrant green and possessing a shiny and smooth surface, were easily manipulated. In contrast the aged leaves were brittle and dry. Plant-based structures incorporated textile and basketry techniques throughout the project, including braiding, weaving, plaiting, and twining. As the project evolved, the prototypes transitioned from flat two-dimensional forms to sculptural, three-dimensional ones. This shift made them more aesthetically appealing, with a noticeable shape, depth, scale, and voluminous presence. As materials intertwine within sculptural forms, they crisscross, bend, and traverse in various directions, each leaf under tension, anchoring the others. The form gradually takes shape as additional materials are added, expanding in width, height, and depth, interconnecting to create a cohesive, structured surface of repeated patterns and movements. These forms imply the potential of

holding or containing something within them (Bunn and Mitchell 2020, Bunn 2016). In the context of this project, prototypes encompass tacit, practical and theoretical knowledge. Challenges encountered during early prototyping served as a guide for future textile structure development. Approaching creative practice-led research at a materials level is significant as it requires the maker to rely on intuition when observing, interacting with materials, and making decisions. As a result, active and ongoing adjustments occur throughout the creative process. Contemporary artists and researchers Mäkelä and Aktaş (2022), and anthropology, textiles and basketry specialist Bunn (2016, 2020), noted the intertwining roles of participation and design.

3.5 Documentation and reflection: continuous consideration and evolving connections

I employed various methods throughout this project to document and capture diverse observations and reflections which facilitated robust connections between theoretical ideas and physical outcomes. The visual diary played a crucial role, involving sketching the overall form of the textile structure, brainstorming specific parts of the plants and intended making techniques. Authors Ellison, LeRoy, Landsbergen, et al. (2018) highlight drawing as a highly effective research method for stimulating engagement. Photographs proved to be instrumental in capturing colour palettes, material textures, and visually appealing patterns and movement; images which served as prompts for ongoing reflection. Audio recordings facilitated the expression of thought, and transcription summarized critical learnings. Video recordings provided a dynamic audio-visual platform, allowed movement on-site while conducting analyses as the environment influenced and stimulated new thoughts. Timelapse recordings were effective in highlighting areas of action and motion, emphasizing (human) recurring bodily positions during fieldwork and (plant species) movements in response to environmental factors, such as wind.

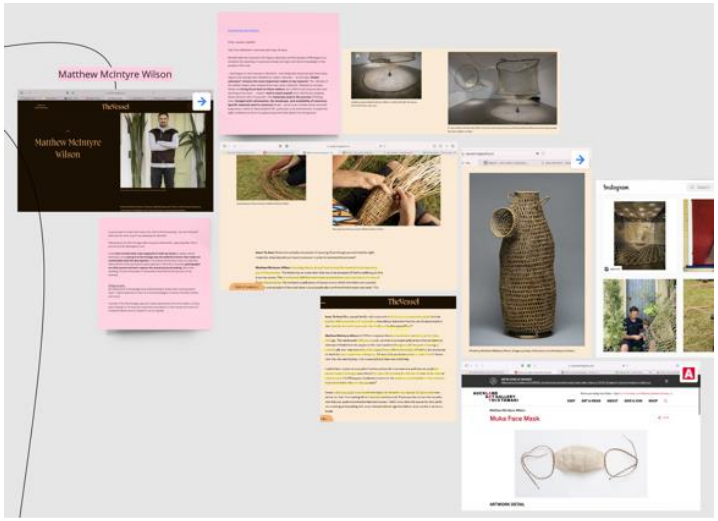


Figure 30. Zoomed in Miro, showing visual and textual documentation, 19.04.2023, https://miro.com/app/board/o9J_lvDBnAk=/?share_link_id=475841626109.

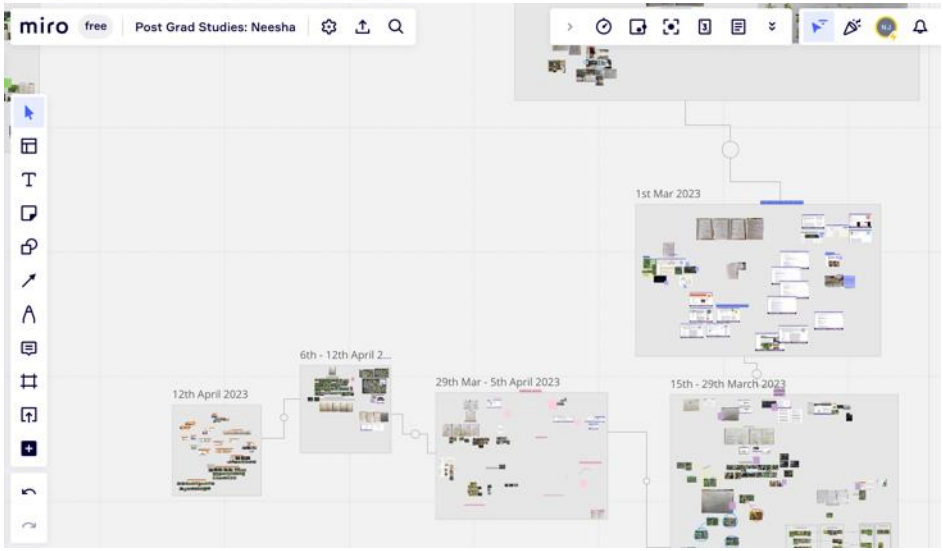


Figure 31. Digital workbook showing overarching workflows and project progression, 19.04.2023, https://miro.com/app/board/o9J_lvDBnAk=/?share_link_id=475841626109.

I utilized the digital mood board platform, Miro (figures 30-31), to collate the research and documentation in accessible, nontechnical, descriptive language; it is a dynamic, interactive, accessible workspace that facilitates intuitive exploration and flexibility. Photo study, video and timelapse played vital roles in capturing the visual experience of the site providing accessible, quick, and effective means to communicate workflows and prompt reflection. Wide shots framed the overarching boardwalk area, creating a sense of depth and scale, helping situate the plants within a larger space and indicating their relative positioning. I framed close-ups to capture intricate details, contrasting texture, pattern and colour compositions. Moving images, timelapse and video recordings captured and documented prototypes taking form during the making process––my movement between plant species, moments of pause to write in the visual diary and crouching down to remove unwanted plants.

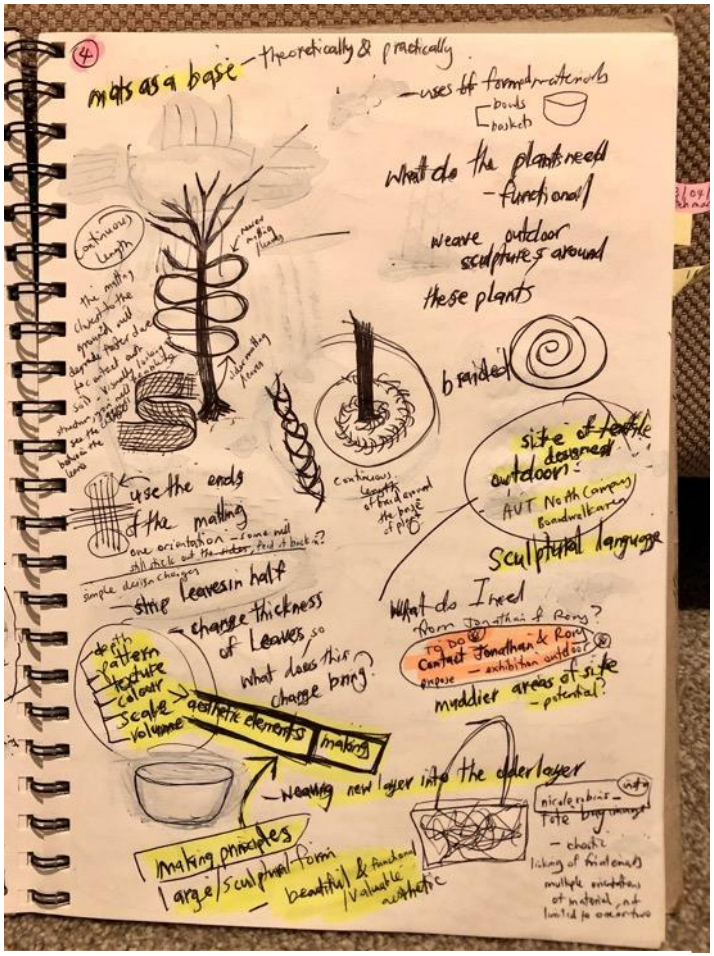


Figure 32. Supervision meeting documentation in visual diary with key learnings highlighted and drawings visualising potential textile structures, 12.04.2023.

Visual diary notes taken during fieldwork and supervision meetings provided core dialogue that strengthened the project's overall direction (figure 32). I considered the work critically throughout, continuously browsing through Miro and visual diaries, extracting essential insights. As it evolved, I updated the mood board, allowing existing ideas to grow and form new connections, relationships, and patterns--developments which brought forth new meanings, depth and nuance. This active process helped me frame a broader context, construct a compelling narrative, and create an overarching picture of the work.

Chapter four: *soaring and gliding*

This chapter documents the practice, findings and reflections from site three: AUT North Campus – institutional landscape.

4.1 Connecting with site and materials

During early site visits, I situated myself within the local ecology and gathered data on the boardwalk natives through a range of methods including photo study, diary, video, drawing, brainstorming, reflection, and observation. I utilized Miro to collate this documentation, grouping them chronologically to clarify the project's progression. As it advanced, the focus of the project shifted to collecting harakeke and removing unwanted species at the base of native plants alongside the boardwalk; actions which showcased human gesture, demonstrating engagement and interaction with the ecological surroundings. During site observations, I noted that approximately half of the natives appeared healthy. The remaining plants exhibited signs of stress; crunchy brown leaves and vacant posts indicated where plants had been growing. I documented this in a visual diary, mapping the spacing and composition of the plants, applying my learnings from Kaipatiki. I did not know the names of many of the native species but learned to distinguish via observation, drawing leaf shapes and noting colour and size (figure 33). I used descriptive terms, 'big shiny green leaf,' 'droopy spikes,' and 'orangey green leaf' until AUT grounds staff confirmed the scientific and indigenous names.

Figure 33. Initial drawing of boardwalk area showing spacing of plants, leaf shape and makeshift names, 21.02.2023, AUT North.

Figure 34. Fresh and dried harakeke (New Zealand flax, phormium tenax) bundles ready for prototyping, 13.04.2023, AUT North.

Once I had identified healthy plants of the same species in the boardwalk area, I selected individual plants for prototyping. During this phase, I focused on harakeke to understand its potential and unique qualities. Guiding my exploration was the question of how plant-based textile prototypes could support other plants alongside the existing structures at AUT North campus. Interacting with the ecology, I made some observations; freshly harvested leaves were heavier because they retained moisture, the leaves were supple, easy to manipulate and could be pulled taut without breaking, aged leaves were lighter and drier causing edges to curl up, reducing flexibility when attempting to bend them into different forms (figure 34).

Figure 35. Fresh harakeke matting showcasing a tight plain weave (one-over, one-under) 25.02.2023, AUT North.

Figure 36. Numerous layers of harakeke matting - fresh leaves upon old, 08.04.2023, AUT North.

4.2 Exploring temporary textile structures

I started prototyping with two-dimensional harakeke woven matting (figures 35-36). Fresh material proved more suitable for incorporating into a matting structure, as its flexible qualities allowed a closer mesh of interlinking leaves. When creating the mat, I split the harakeke down the middle, separating the left and right sides. I used all parts, including the hard, woody core and the supple pointy tip, to add visual interest and textural contrast. Handling and lifting the structure made the distinctive plain weave pattern––one-over, one-under––more evident. The tension between each alternating leaf played a significant role in holding the structure together and strengthening its overall form. These prototypes served as ground cover for the plant, covering the soil at its base. Any excess material not utilized in matting prototypes was chopped and repurposed as loose mulch (figure 37).

Figure 37. Excess plant material repurposed as mulch around makamaka (ackma rosifolia) plant, 18.04.2023, AUT North.

Figure 38. Checking soil under matting for other or unwanted plant species, 28.03.2023, AUT North.

I monitored progress and changes on-site through photography. In my visual diary, I detailed the name of the plant, the date of each visit, and the timings for making and removing unwanted or other plant species. Timekeeping allowed me to gain insights into the investment of each task during fieldwork, as well as the various forms of making. Weaving a harakeke mat typically took around thirty minutes, while eliminating unwanted plants took approximately ten minutes. I encountered variations in conditions; some areas were dry (figure 38), while others appeared moist with a muddy, clay-like consistency. Living materials like harakeke degrade after being cut from the plant and being exposed to various environmental elements; shrinkage was noticeable when I returned to the site for further fieldwork.

Site visit 28/03/23; 11:23 am (figure 39)

Fresh harakeke material had shrunk in the matting structures, creating gaps between the leaves, so to address this, I realigned the strands closer together, ensuring a tighter weave once again. I discovered new plants in the soil underneath the matting, indicating that the textile structure was ineffective in controlling unwanted growth. I gently removed these species, clasping my forefinger and thumb together, pulling them out, hearing the satisfying 'pop' of the plant roots being pulled free from the soil. Can I weave new strips into the older layer to fill the spaces? Will multiple layers of matting suppress unwanted plants? Can matting layers be arranged at different angles for maximum coverage? Is there a way to harness shrinkage to benefit the making process? While I adjusted the mat structures, ants and worms moved around in the earth, disturbed by my presence, so I quickly covered them with soil.

Figure 39. Other or unwanted plant species sprouting up between the gaps of the shrinking, ageing matting, 28.03.2023, AUT North.

The reflection above raises an ecological question: do the mat structures create a habitat for other species? The boardwalk area is subject to continuous disturbances. AUT grounds staff and this research project contribute to the ongoing developments on site, fostering continual and unforeseen changes.

Site visit 08/04/2023; 12:38 pm (figures 40-42)

As I arrived at the boardwalk area, abundant new plant species were present. I noticed individual harakeke leaves scattered on the ground, indicating dismantled textile structures. Nearby, a substantial pile of moist mulch covered the matting surrounding other native plants. I examined the material closely and discovered its properties were different; the aging leaves had regained moisture and flexibility. With numerous plants surrounding me, mapping the layout of the new native species proved challenging. It was clear that the original plan for the site visit needed to be adjusted, but what should the next course of action be?

Figure 40. Damp mulch covering matting around rimu (dacrydium cupressinum) plant, human disturbance from grounds staff, 08.04.2023, AUT North.

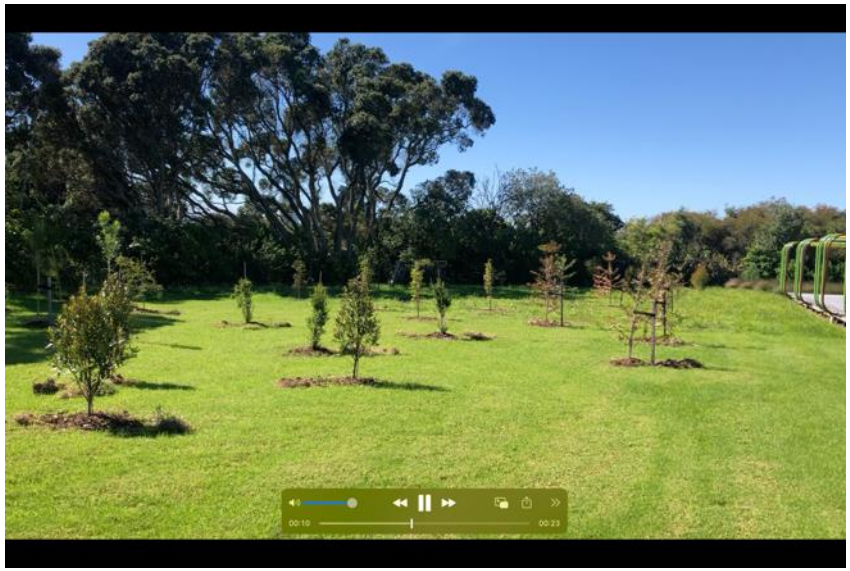


Figure 41. Screengrab from video reflection regarding the new native plants in boardwalk area, 08.04.2023, AUT North.

Figure 42. Visual diary drawings and map showing new native plants in boardwalk area, 08.04.2023, AUT North.

4.3 Moving into sculptural practice

The prototypes started as two-dimensional designs, but the disturbances in the boardwalk area catalysed their transformation into three-dimensional forms. They took on shape, depth, and dimension, blurring the borders between textiles and basketry and prioritizing a multi-layered sculptural aesthetic over functionality. During brainstorming sessions, I documented ideas in a visual diary, with drawings emerging as the most valuable method for visualizing the intended textile structures. I used sketches to establish connections with other relevant information and explanatory notes, which suggested making techniques and specific parts of the plant to utilize. These pages in the visual diary became valuable resources for planning upcoming site visits and prototyping. Although not all ideas and drawings materialized, they were valuable reference points for potential developments. Additionally, I recorded the evolution of the textile structures through videos and timelapses.

Insights gained from the initial making emphasized the importance of quick prototyping with larger pieces of plant materials, enabling prompt feedback and adjustment. To achieve a more balanced proportion of time, effort, and scale, each subsequent textile structure was completed within approximately one day. A summary of critical findings and reflections for sculptural prototypes to date follows.

Figure 43. *Woven S mat* around makamaka (ackama rosifolia) plant, 16.04.2023, harakeke (New Zealand flax, phormium tenax) , AUT North.

Woven S mat 16.04.23 (figure 43).

The S mat began with a weave around the base of the plant in the boardwalk area. The prototype was unexpectedly heavy, especially along the edges. My core and arm muscles required substantial effort to lift and incorporate new material into the weave. The overlapping, interlinking patterns suggested flow, and the matting length grew with each new addition of harakeke. Maintaining the tightness of the plain weave became more challenging. The pattern structure opened up, revealing significant gaps between the individual leaves. I joined two corner ends and securely attached them to the branches above to lighten the load and ease the burden during the making process. Its intended function is to offer ground cover and reduce plants growing underneath. This prototype developed the two-dimensional matting structure into a clean-edged, dynamic, and continuous length. Would the S shape of the plant material change as it aged?

Figure 44. In progress *kete basket braid* around makamaka (ackama rosifolia) plant, 16.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Figure 45. Detail shot of plaited edge of *kete basket braid*, 16.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Kete basket braid 16.04.23 (figures 1, 44). Creating a substantial basket was satisfying, as the broader width of the leaves promoted larger forms and patterns. Leaves were arranged around the base of the plant stem, offering ground cover. As I transitioned from plain weave to the plaiting technique, the structure extended upwards, revealing diagonal leaf patterns. The braided top of the prototype had a distinctive, appealing and voluminous aesthetic, which set it apart from the other textile structures (figure 45). Can the functionality of the mat be enhanced by incorporating excess harakeke plant material cuttings within its form?

Figure 46. *Dried birds nest* around kauri (agathis australis) plant, 18.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Dried birds nest 18.04.23 (figure 46).

The inspiration for this prototype came from bundles of dried harakeke gathered near the harvest site. I secured the crunchy, dried, and ageing leaves together tightly with thin strips of fresh harakeke, ensuring there was minimal stray material sticking out. I bent the individual bundles into a circular border surrounding the base of the plant. This process proved physically demanding and often required the assistance of my knee. The bottom circle had the largest circumference, while subsequent groups became progressively smaller in rim and height. This textile structure provided partial shade, but could several woven matting layers be placed between the bundles to create a mini microclimate for the plant?

Figure 47. *Vertical woody base fence* around taraire (beilschimedia taraire) , 18.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Figure 48. *Vertical woody base fence*, detail of twining technique, 18.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Vertical woody base fence 18.04.23 (figure 47). With force and care, I created slits in the ground with long-bladed loppers. As I pushed the hard ends of the fresh harakeke leaves into the soil around the base of the plant, the material bent a little. Each piece stood vertically, creating a circular formation and offering partial wind protection for the stem. Thin strips of twined harakeke connected the overall form into a fence-like structure (figure 48); incorporating additional material would likely provide further support, but how can I assess the effectiveness of the design in reducing wind impact on the plant?

Figure 49. New planted kauri (agathis australis) leaning over due to gusty winds, 24.04.2023, AUT North.

Site visit 24/04/23; 12:45 pm (figure 49)

Strong gusts had impacted the boardwalk area, and several new native plants were slanting towards the ground. Although the plants are still rooted in the soil, they should be secured to minimize issues in the future. After surveying the wind-beaten area, existing plant textile structures were studied. The mulch chips had considerable proportions of soft beige and dark brown earthy tones, indicating the leaves were drying out and ageing, whereas, the kete showcased new small plants in the soil underneath. As I reviewed the timelapses taken that day, the vivid movements of plants, branches, leaves, clouds, sun, and shadows within the space were highlighted, each shifting with the forceful gusts of wind, progressing across the grounds, changing direction and flow (figures 50-53)."

Figures 50 - 53. Screengrabs of timelapse, capturing transitions and iterations of fieldwork movements in boardwalk area, 24.04.2023, AUT North.

Figure 54. *Braided length* around kauri (agathis australis) plant, visualising how the braid will stabilize the plant during wind, 24.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Figure 55. Screengrab from video documentation, in-progress making of *braided length*, 24.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Braided length 24.04.23 (figures 54-55).
A braided length supported plants upright during windy weather. I secured this rope to a wooden post and pulled the harakeke material taut. Leaves emerged throughout the length, indicating the addition and connections of new material to extend the braid. After positioning it around the stem, I secured it to a nearby stake. Still, the plant started leaning again, possibly due to inadequate initial tension or a change in wind direction. I resolved the issue by untying and retying the length to another wooden post, which stabilized the plant again. By adding extra material, I could further extend it. Do the textile structures in the boardwalk area create visual connections between the plants?

Figure 56. *Upside down* kete around rimu (dacrydium cupressinum) plant, 27.04.2023, harakeke (New Zealand flax, phormium tenax), AUT North.

Upside down kete 27.04.23 (figure 56).

By utilizing the entire harakeke leaf, I could accentuate its textures, colours, and patterns. Weaving a tube shape proved challenging, as adding new material caused shifts and disruptions along the edges. Instead of extending the prototype into a complete ring, I changed the intended form, slotting the material ends back into the weave, creating a textile which deviated from the previous making, as I carefully slid it over the plant's branches. The leaves at the top of the tube merged into a plaited pattern around the stem, forming a lid-like structure. Could it diffuse sunshine and offer partial ground cover whilst not being positioned on the soil?

4.4 Summary

Harakeke enabled connections and movements in response to the needs of whenua. The following text identifies iterative cycles and learnings within the project, specifically regarding fieldwork, prototyping, documentation and reflection.

These textile structures' primary function is to support the plants. However, they are also visually appealing with their contrasting textures, colours, and patterns. I determined the structures' physical and aesthetic qualities by closely observing and handling each leaf. By using whole harakeke leaves of greater length and width, each prototype was created within a relatively short timeframe. The baseline textile technique was plain weave, which provided a solid foundation for generating further developments. The experimental structures provided varying degrees of support, including stabilizing the plant's stem in windy conditions, enhancing moisture retention in the soil by diffusing sunlight, and minimizing unwanted plant growth through ground cover. I could assess the impact of a harakeke mat on plant growth by visually inspecting the soil beneath it, and I could tell whether the braided rope had successfully kept the plant upright after windy weather. However, evaluating the effectiveness of specific prototypes such as the dried bird's nest was challenging as there were no clear visual signs that the textile structure effectively supported the plant. If the earth was moist this was more likely due to environmental factors and the pre-existing boggy ground conditions, than the prototype. Creating prototypes around the plant proved to be the most effective approach to securely anchoring the structures to the ground. This method also ensures stability during periods of heavy rain and potential flooding.

Numerous challenges emerged while working in the AUT native boardwalk area, and potential ideas for textile structures arose through my close observation of the surroundings. The potential adaptability of these textile structures in response to human disturbances and weather conditions is significant. I continually made adjustments during fieldwork, such as retying, realigning and tidying leaves in the prototypes, and removing unwanted plants from the soil. I added fresh leaves to fill the gaps resulting from shrinkage and extended the length, height, and width as needed. Furthermore, intentional or unintentional deconstruction of the prototypes became part of their

dynamic short-term value. Having created three-dimensional textile prototypes over the past three months, the rate and extent of their biodegradability remain unknown at this stage. Furthermore, the functional qualities of the prototypes are currently limited and warrant further experimental development. Given the temporary nature of the structures, newly emerged plant growth beneath the textile matting can be removed, providing a clean slate in the experimental testing and design iteration. Now armed with newfound knowledge and insights, opportunities open up for refining and enhancing future textile structures.

Changes and observations at AUT North

During the project, unpredictable weather conditions and elements impacted project work and textile structures. The day and month has been included in the figure captions to offer a more precise seasonal timeline and prototype development trajectory.

In the above paragraphs, I overviewed the textile prototypes as they existed during creation. However, it is essential to recognize that the plant-based structures' physical and aesthetic properties weathered additional transformations in the following months. Harakeke (New Zealand flax, phormium tenax) is a living material that degrades and ages over time and in response to wind, rain, and sunshine on site, resulting in an ever-evolving structure.

A brief discussion of the developments in the braided length, woven ‘S’ mat, and kete basket braid follows and images show the changing colours, textures and forms of the textile structures blending into the landscape.

Figure 57. Wooden posts stabilizing kauri (agathis australis) upright, 17.05.23, AUT North.

Braided length

The initial function of this textile structure was to support a kauri (agathis australis) stem during windy conditions (figure 49, 54), however, wooden posts were later installed by AUT grounds staff to stabilize the plant species upright, therefore making the braided length defunct (figures 57-58).

Figure 58. Defunct *braided length* prototype, 17.05.23, harakeke (New Zealand flax, phormium tenax), AUT North.

Figure 59. Softened plant fibres in *woven 'S' mat,* 08.06.23, harakeke (New Zealand flax, phormium tenax), AUT North.

Figure 60. Screenshot from video documentation, *woven 'S' mat* functioning as a feeding spot for birds, 08.06.23, harakeke (New Zealand flax, phormium tenax), AUT North.

Woven 'S' mat

The initial function of this textile structure was to act as ground cover (figure 43), however, latter site visits suggested the prototype was also functioning as a feeding spot for birds. The plant fibres in the woven 'S' mat had softened due to being in direct contact with the damp, water ridden ground, therefore making it an ideal location for birds to poke their beaks through in search of worms (figure 59-60). Parts of the mat that are in direct contact with the soil contrast against those suspended in the air.

Figure 61. Excess plant material placed within *kete basket braid* as mulch, 08.06.23, harakeke (New Zealand flax, phormium tenax), AUT North.

Kete basket braid

The initial function of this textile structure was to act as ground cover however, excess weight from plant material added into the prototype as mulch, as well as ongoing exposure to the elements flattened the form of the basket down towards the ground. The edges had been pushed outwards, generating a natural curve (figures 61-62), one of which was not evident during initial making (see figure 1).

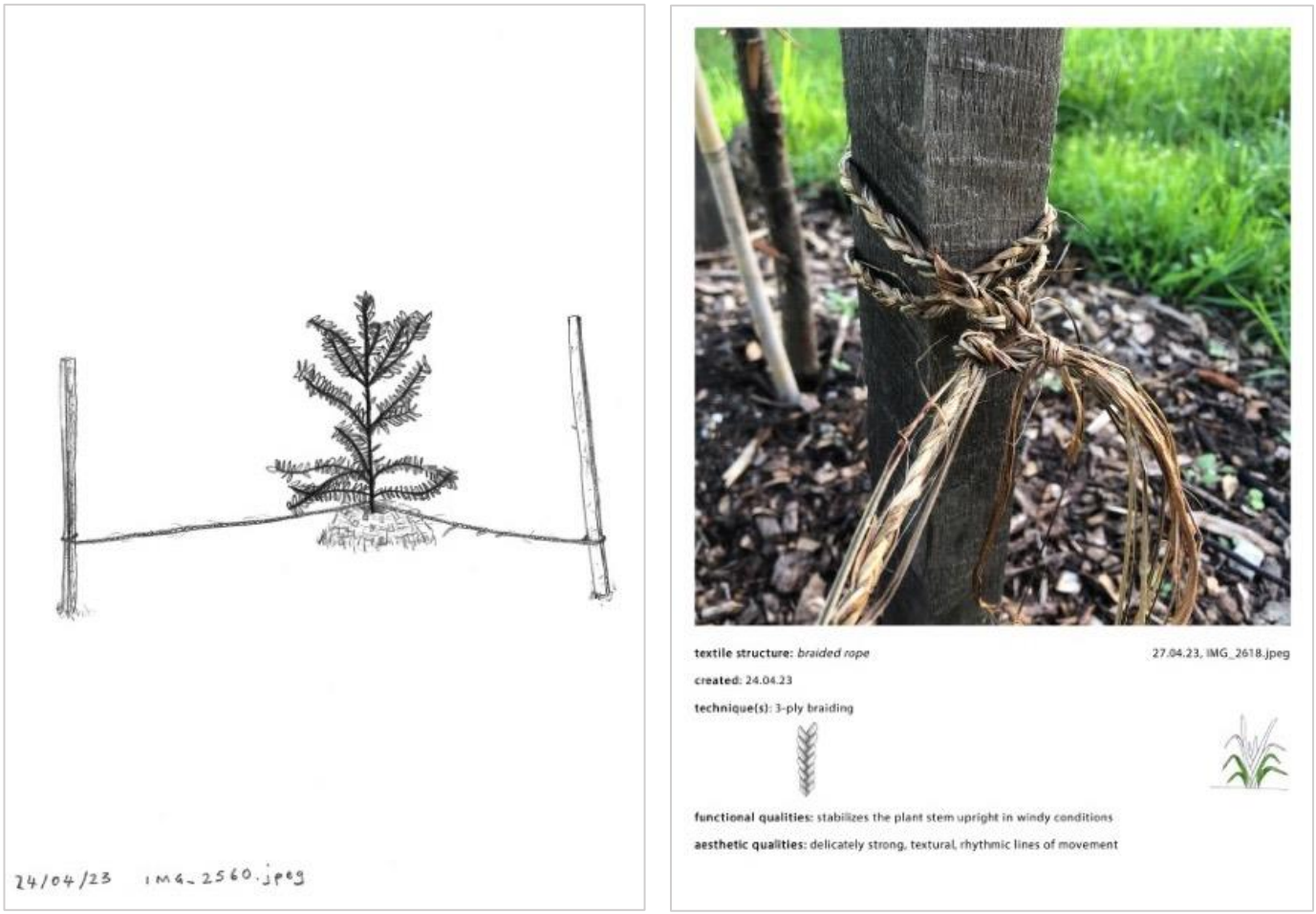
Figure 62. Natural curves forming along the edges of the textile structure, 08.06.23, harakeke (New Zealand flax, phormium tenax), AUT North.

4.5 Textile catalogue

A catalogue of the textile structures was produced to document the observations and learning from this phase. This catalogue (see Appendix I) presented as double-sided, A5 size pages provides a summary of textual, visual, and descriptive information, including detailed observational imagery, photographs and illustrative drawings of the overall plant form, as well as leaf shape, patterning and colour. The following bullet points explain the significance of each component in the catalogue pages, specifically the braided rope prototype (figures 63-64).

- The name of the **textile structure: (braided rope)** is a combination of information, often the making technique (braiding) and the intended function or use (rope). The name suggests what the structure visually looks like, and therefore makes it quick to identify a prototype.
- The date **created: (24.04.23)** offers a time marker for making which can be connected to seasonal and weather patterns and shows the progression of sculptural prototypes.
- The **image number: (IMG_2618.jpeg)** and associated **date (27.04.23)** make it easy to locate documentation/digital files.
- The making **techniques: (3-ply braid)** is a combination of text and visuals. A drawing acts as a guide for how the textile structure looks once complete, and the text clarifies technique details. For example, that it is made from three different strands of material (3-ply).
- The **harakeke plant drawing** visually indicates parts of the plant material used during making.
- The **functional qualities: (stabilizes the plant stem upright in windy conditions)** indicates the value and intended use of the textile structure at the time of creation. (As noted in the above paragraphs, some textile structures have taken on new functions, while others have been made defunct).

- The **aesthetic qualities: (delicately strong, textural, rhythmic lines of movement)** indicated the visual appeal of the textile structure, specifically observations regarding colour, texture, pattern, depth, scale, volume, shape, line, space, balance, movement, repetition, and contrast.



Figures 63 – 64. Catalogue pages. Braided rope implemented around kauri (agathis australis) plant, 2023, harakeke (New Zealand flax, phormium tenax).

4.6 Master of Design graduating exhibition

St Paul Street Gallery, 29th June - 1st July 2023

A significant amount of practical work was implemented outdoors at AUT North campus during this project; however, two textile structures, 'kete basket braid' and 'woven matting' were explicitly recreated for the exhibition at AUT city campus. There were similarities in how work was presented and explored at AUT North and AUT city campuses. As visitors moved around the gallery, areas of heightened activity emerged around the kete basket braid and woven matting. Additionally, these textile structures were interacted with from the ground level (figure 65). A young, growing harakeke plant placed inside the kete (figure 67) emphasised the nurturing gestures toward plants, signifying an evolving respect and care for this living material and species, which was central to the67 project. Placing the woven matting beneath the kete allowed viewers to envision the textile structures' potential applications (figure 68). The fresh harakeke plant contrasted against aged, dried, and shrunken leaves in the prototypes, creating noticeable gaps within the interlocking plain weave pattern (figures 70-71) and braided top (figure 69). Exhibitions are ideal for showcasing creative work as they are neutral spaces (Kwon, 2002). However, in this gallery, a television screen displayed digital timelapses, offering a vivid glimpse into the making process of the woven 'S' mat, dried birds nest and kete basket braid (figure 66). This video documentation 'transported' viewers to the outdoor boardwalk area at AUT North, immersing them in a different ambience and atmosphere. Visitors could browse textile catalogue pages to gain a deeper, more intricate understanding of the relationship between project documentation, physical prototypes, and harakeke plant material.

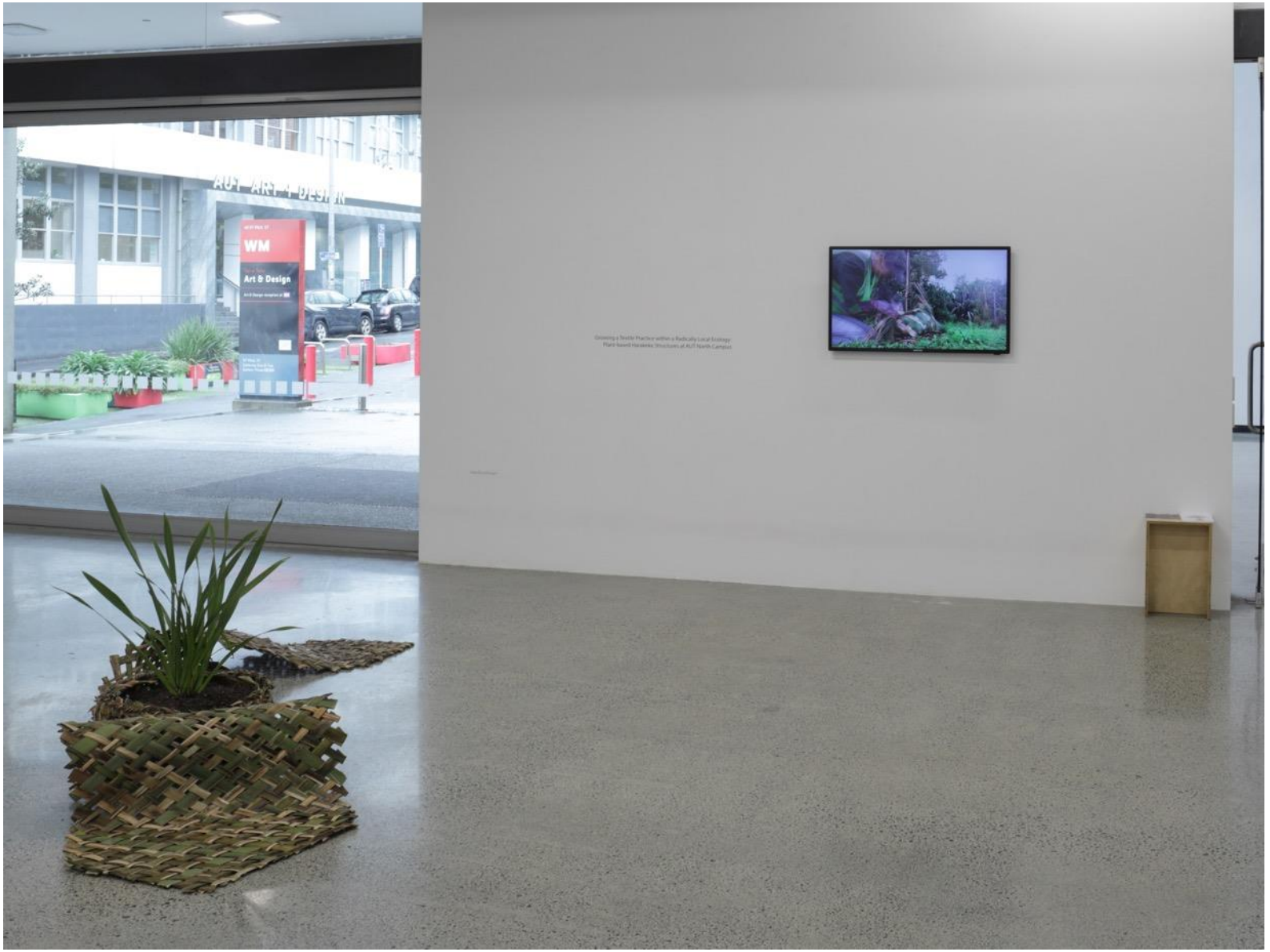


Figure 65. Paul Chapman, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

Figure 66. Paul Chapman, *Plant-based structures: Growing a textile practice in an ecologically local context:*, timelapse documentation capturing on-site making process of plant-based harakeke structures at AUT North Campus, 2023, St Paul Gallery.

Figure 67. Fresh harakeke plant within kete, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

Figure 68. Woven matting placed under kete, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

Figure 69. Detail of braided top on kete basket braid, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

Figure 70. Gaps in plain weave pattern, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

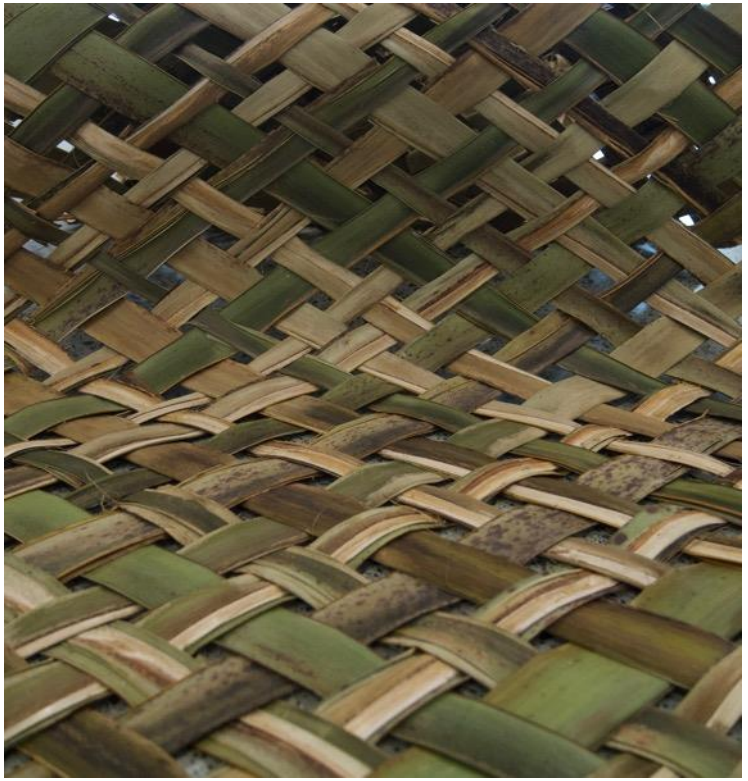


Figure 71. Detail of aged, dried, shrunken woven mat, *Plant-based structures: Growing a textile practice in an ecologically local context,* exhibition documentation, 2023, St Paul Gallery.

4.7 Discussion and Insights

Physical and aesthetic properties of plant species: transformations of colour, sound and texture within harakeke

Living plant species can be used as materials, however they deteriorate over a short period of time, undergoing a wide range of transformations during their life cycle as they adapt and respond to their surroundings. Properties dormant in one instance reacted and offered valuable feedback in another, creating dynamic new forms and relationships. Working closely with the material from start to finish, the body, mind and senses focused on the various physical and aesthetic properties--these temporary changes are evident in the following text which details observations made during harakeke harvesting.

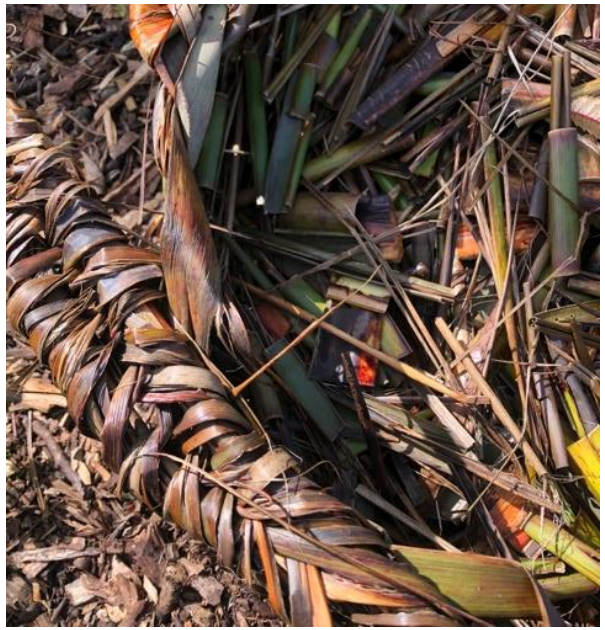


Figure 72. Detail of aged, browning braided kete prototype containing fresh plant material, 18.04.2023, AUT North.

I used a sharp knife to gradually cut the outer leaves near the ground. Some leaves are fresh, deep green and vibrant while others are dried, brittle, and degrading, dominated by earthy brown pastels, deeper shades of burgundy and ochre, as I hold them steady before cutting, they crunch in my hand. Some leaves are in a state of transition, colour palette encompasses a spectrum of earthy tones from green, to warmer yellowy-orange-reds, to deeper maroon, purple hues. As the blade slices cuts through the fibres in the woody, stiff, thicker part of the leaf, the sound is crisp, distinctive, and satisfying, a version of music to the ears of those who make with plant materials. This base provides a solid foundation for the soft, smooth, supple pointy end of the plant leaf which extends out, catching the sunlight as I work and creating a lovely sheen. As dried leaves are cut and pulled away, added to the growing pile of harakeke off to the side, there is more space to move, both for the plant and the harvester. A spectrum of contrasting colours and textures highlighted where each leaf was within the ageing process.

Figure 73. Fresh and aged plant material chopped into mulch creating an eclectic mix of qualities, colours and textures, 18.06.2023, AUT North

I made design decisions at AUT North to emphasize the sound, texture, and colour properties of harakeke. A dynamic interplay of functionality and degradation characteristics emerged by gradually incorporating additional material into textile structures and layering fresh and aged plant leaves together (figures 72-73). During the research process, ideas emerged regarding the use of plant materials in different weather conditions. It became apparent that implementing prototypes outdoors exposed them to uncontrollable temporary disturbances, including rain, wind, and sunshine. These dynamic and ever-changing movements influenced the actions of living species in the surrounding environment, including myself. Would subjecting plant materials to significant fluctuations accelerate their degradation? Observing damp conditions and subsequent rain, revealed the potential for reinvigorating dried leaves, temporarily restoring their supple qualities. Can weather conditions ––the transformative power of the elements––be harnessed to expedite, enhance, or provide alternative approaches for working with harakeke and other plant materials?

Mutually supportive languages

This project seeks to communicate a narrative of mutually supportive dialogue, where knowledge emerges through the visual reading of the document. Descriptive language is pivotal in facilitating clear recognition and understanding of concepts. By integrating complementary visual imagery and textual representations of data, information is enhanced and accessible. Through a series of documentation methods, photo studies, timelapses, videos, drawings, reflective diary notes, and written observations, the creative thought process is refined, allowing precise ideas to emerge, and be interpreted by the viewer. This project fosters a rich exchange of knowledge through the carefully crafted combination of visual and textual elements, ensuring the work resonates with diverse audiences and encourages meaningful engagement. A tangible outcome of mutually supportive languages is a catalogue of prototype samples highlighting textual, visual, and descriptive elements (see appendix I for full catalogue).

Transitions and iterations of movement: emerging paths, hot spots, and stances

One aspect of movement during fieldwork involved recurring adjustments between active and static states. Mesmerizing rhythms of repeated sets of motions and bodily positions emphasized the varied spectrums of engagement and acted as catalysts for reflection. Capturing transitions of movement on-site was critical. Action instinctually evolved in response to observation; my body experienced tacit learnings. One common element between the prototypes is the physicality of the making process. Maintaining specific positions for extended periods lead to muscle and bodily fatigue. When fresh harakeke leaves are gathered and layered to form a textile structure, they contribute considerable weight. This became apparent when consistently lifting the prototype while tidying and shaping the edges. Making textile structures on the ground necessitates an active crouching position, which can strain the lower back, ankles and knees. Furthermore, even with protective gloves minimizing the impact, splitting leaves down the middle of the rib can lead to tenderness in the hands and skin.

Working within and around the harvest area was intimate and challenging; long, brittle leaves limited the space between plants, scratches, rashes, and cuts on the skin were common. By kneeling on the ground, I learnt to stabilize my center of gravity and maintain balance while vigorously cutting and pulling out mature, aged leaves. These pockets of space facilitated the breathability and growth of the remaining leaves on the plant. Interestingly, this pruning process mirrored my development and experience throughout the project.

Chapter five: *landing*

5.1 Conclusion

This practice-led research encompasses a series of experiments across different sites; Kaipatiki, Northcote residence and AUT North. I explored ecologies near my Northcote home and embraced the ecologically local concept to nurture mutually supportive partnerships and alternative perspectives within my textile practice. The fieldwork carried out at Kaipatiki and Northcote early in the research underscored the vital role of plants in materials-driven explorations and the value of reflective, tacit, hands-on learning. Engaging in human disturbance practices; tending, harvesting, foraging, and observing plants at these sites allowed me to foster a sense of care and attention towards whenua. These experiences were valuable opportunities to cultivate more profound relationships with plant materials in each ecology and laid the foundation for further exploration in my research journey.

Throughout the project, I engaged with indigenous Māori worldviews. This approach enriched my understanding of tikanga and creative practices involving harakeke. Due to its appealing characteristics and abundant availability, this plant material is a valuable "meeting point" for individuals in Aotearoa, as it fosters connections and meaningful experiences. Fieldwork, prototyping, documentation, and reflection methods were a platform to embrace hands-on approaches to research and facilitated the emergence of visually descriptive, accessible, in-depth narratives. Kuku, Ōkahu Bay, and Te Arawa Lakes are critical case studies that underscore the pressing need for holistic ecological management and care approaches concerning environmental challenges. These projects are grounded in their ecologically local contexts and foster communities, land, and plants. By drawing inspiration from indigenous knowledge, utilizing the distinctive characteristics of living materials and leveraging the potential of textile-making processes, there are further opportunities for creative solutions to be implemented around Aotearoa.

AUT North provided an ideal setting to explore plant species' changing physical and aesthetic properties. Active engagement during fieldwork revealed valuable points of tension within the landscape. During the research, dynamic transitions and instinctual actions evolved in response to the local ecology. Additionally, this site facilitated the development of short-term plant-based textile structures that are ecologically and economically viable. The prototyping phase highlighted the value of quick, larger-scale temporary designs and challenges encountered during the making phases were pivotal in shaping the research trajectory. In the context of this project, textile structures encompass a broad and evolving spectrum of theoretical, tacit, and practical knowledge. By leveraging the temporary nature of textile structures and removing unwanted or other plant growths beneath the mats, new possibilities emerge for iterative testing and design experimentation. Assessing the effectiveness of matting or ground cover textile structures is the most straightforward, as the prototype gets lifted to observe the soil. Further development is required if the textile structures are to be functional and aesthetic. The transition from two-dimensional to three-dimensional work during prototyping delved into various aesthetic qualities; colour, pattern, texture, depth, scale, volume, shape, line, space, balance, movement, repetition, and contrast. The textile structures created during this project encompassed a realm of design elements and visually tactile possibilities.

The process of materials driven making, the presence of living materials, and the influence of weather weave together, forming interconnected partnerships. The project celebrates the dynamic movements that appear within practice-led research. A valuable dialogue emerged through exploring this experimental space within textiles and design, emphasizing the influence of other species on the decision-making processes. By emphasizing my role as a "maker" in creative practice, this project provided an evolved perspective on the potential and value of plants in materials-driven research.

Bibliography

Bathgate, Benn. “Diving into mātauranga Māori to find an 800-year-old solution for 70-year-old problem.” *Stuff,* December 1st, 2021. https://www.stuff.co.nz/national/127139749/diving-into-mtauranga-mori-to-find-an-800yearold-solution-for-70yearold-problem

Bayes, Chantelle. "Creative writing as a means of reimagining gardens." *Australian Geographer* 54, no. 1 (2023): 45–58.

Bunn, Stephanie J. "Who designs Scottish vernacular baskets?." *Journal of Design History* 29, no. 1 (2016): 24–42.

------. “Weaving and flying: Fusion, friction and flow in collaborative textile research.” *Journal of Arts & Communities* 10, no. 1-2 (2020): 129–141.

Bunn, Stephanie, and Victoria Mitchell, eds. *The Material Culture of Basketry: Practice, Skill and Embodied Knowledge*. Bloomsbury Publishing, 2020.

Chitham, Karl, Kolokesa Māhina-Tuai, and Damian Skinner. “Crafting Aotearoa: A Cultural History of Making in New Zealand and the Wider Moana.” Te Papa Press, (2019).

Ellison, Aaron M., Carri J. LeRoy, Kim J. Landsbergen, Emily Bosanquet, David Buckley Borden, Paul J. CaraDonna, Katherine Cheney, Robert Crystal-Ornelas, Ardis DeFreece, Lissy Goralnik, Ellie Irons, Bethann Garramon Merkle, Kari E. B. O’Connell, Clint A. Penick, Lindsey Rustad, Mark Schulze, Nickolas M. Waser, and Linda M. Wysong. "Art/science collaborations: New explorations of ecological systems, values, and their feedbacks." *Bulletin of the Ecological Society of America* 99, no. 2 (2018): 180–191.

Jones, Alison, and Kuni Jenkins. “Rethinking Collaboration: Working the Indigene-Colonizer Hyphen.” In Handbook of Critical and Indigenous Methodologies. Thousand Oaks, SAGE Publications, 2018.

Kane, Faith, Huhana Smith, Rangi Te Kanawa, Tanya Maree Ruka Te Miringa Te, and Angela Kilford. "Learning from Harakeke Towards a Network for Textile Design in Aotearoa New Zealand." In *Design and Nature: A Partnership*, pp. 72–78. Routledge, 2019.

Kwon, Miwon. "One place after another." *Cambridge, Massachusetts and London* (2002).

Fletcher, Kate, Louise St Pierre, and Mathilda Tham, eds. *Design and nature: A partnership*. Routledge, (2019).

Ford, Daniel, and Sean Blenkinsop. "Learning to speak Franklin: nature as co-teacher." *Journal of Outdoor and Environmental Education* 21 (2018): 307–318.

Gillman, Len Norman, and Shane Donaldson Wright. “Restoring indigenous names in taxonomy.” *Communications Biology* 3, no 1. (2020): 609.

Heimann, Aaron, and Fabien Medvecky. "Attitudes and motivations of New Zealand conservation volunteers." *New Zealand Journal of Ecology* 46, no. 1 (2022): 1–13.

Hiroa, Te Rangi. "The Maori craft of netting." In *Transactions and Proceedings of the New Zealand Institute*, vol. 56, pp. 597–646, (1926).

Ingold, Tim. "The textility of making." *Cambridge journal of economics* 34, no. 1 (2010): 91–102.

Jacobson, Adam. "Mussel laden ropes aim to restore Ōkahu Bay shellfish beds." *Stuff,* October 8th, 2017. https://www.stuff.co.nz/auckland/local-news/central-leader/95558972/mussel-laden-ropes-aim-to-restore-okahu-bay-shellfish-beds.

Jansen, Monique. "The Kuku Biochar Project, April 2021." *Drawing Open* (blog), https://www.drawingopen.com/blog/2021/5/10/kuku-biochar-project.

------. "The Kuku Biochar Project, May 2021." *Drawing Open* (blog), https://www.drawingopen.com/blog/2022/9/11/the-kuku-biochar-project-may-2022.

------. "The Kuku Biochar Project, July 2022." *Drawing Open* (blog), https://www.drawingopen.com/blog/2022/9/11/the-kuku-biochar-project-july-2022.

------. "The Kuku Biochar Project, October 2022." *Drawing Open* (blog), https://www.drawingopen.com/blog/2022/11/9/the-kuku-biochar-project-october-2022.

------. "The Kuku Biochar Project, November 2022." *Drawing Open* (blog), https://www.drawingopen.com/blog/2022/11/9/the-kuku-biochar-project-november-2022.

------. "The Kuku Biochar Project, December 2022." *Drawing Open* (blog), https://www.drawingopen.com/blog/2023/2/14/the-kuku-biochar-project-december-2022.

Keune, Svenja. "Co-designing with plants. Degrading as an overlooked potential for interior aesthetics based on textile structures." *The Design Journal* 20, no. sup1 (2017): S4742-S4744.

Kimmerer, Robin. *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teachings of plants*. Milkweed Editions, (2013).

Lively, Penelope, Nigel Slater, Jamaica Kincaid, Francesca Wade, Jon Day, Paul Mendez, Niellah Arboine, Claire Lowdon, Daisy Lafarge, Zing Tsjeng, Kerri Ní Dochartaigh, Elizabeth-Jane Burnett, Caroline Craig, Victoria Adukwei Bulley. "In the Garden: Essays on Nature and Growing." Daunt Books, (2021).

Lord, James, Roderick Wylie, and Geoff di Girolamo. "SURFACEDESIGN: Material Landscapes." The Monacelli Press, (2019).

Mäkelä, Maarit, and Bilge Merve Aktaş. "In dialogue with the environment: The environment, creativity, materials and making." *Craft Research* 13, no. 1 (2022): 9–34.

Mazzola, Carlotta, and Alessandro Liuti. "Temporariness of textile architecture. A comparative study on innovation." *AGATHÓN/ International Journal of Architecture, Art and Design* 4 (2018): 195–202.

Merfield, Charles N. "Redefining weeds for the post-herbicide era." *Weed research* 62, no. 4 (2022): 263–267.

Miao, Menghe, Anthony P. Pierlot, Keith Millington, Stuart G. Gordon, Adrian Best, and Michael Clarke. "Biodegradable mulch fabric by surface fibrillation and entanglement of plant fibers." *Textile Research Journal* 83, no. 18 (2013): 1906–1917.

Myers, Natasha. "How to grow livable worlds: Ten not-so-easy steps." *The world to come* (2018): 53–63.

Niedderer, Kristina, and Katherine Townsend. "Nature as source and inspiration for materials and making." *Craft Research* 13, no. 1 (2022): 3–8.

Partsch, Niki. *"One year on: Uwhi trial expands." Heritage New Zealand,* February 1st, 2023. https://www.heritage.org.nz/news/stories/one-year-on-uwhi-trial-expands.

Paul, Roshan. ed. *High performance technical textiles.* John Wiley & Sons, (2019).

Pendergrast, Mick. Māori Fibre Techniques: A Resource Book for Māori Fibre Arts: Ka Tahi Hei Tama Tū Tama. Reed, 2005.

Ricciardelli, Alessandra, and Elio Borgonovi. "Resilience And Localism: Sustainable Collaborative Communities As Organisation Systems. Matera 2019: A Case Study." *Resilience and Localism: Sustainable Collaborative Communities as Organisation Systems. Matera 2019: A Case Study* (2018): 47–74.

Rickard, Paul P., and Paul Alan Cox. "Custom umbrellas (poro) from Pandanus in Solomon Islands." *Economic Botany*38, no. 3 (1984): 314–321.

Riley, Michelle. "Harakeke: New Zealand Flax: an historical perspective and overview of current research into future use." (2004).

"Traditional flax bassinets for Bay babies aimed at curbing infant deaths." *Stuff,* December 1st, 2016. https://www.stuff.co.nz/life-style/parenting/baby/87078936/traditional-flax-bassinets-for-bay-babies-aimed-at-curbing-infant-deaths.

Treacher, Aroha. "Harakeke casket now available for whānau in Hastings." *Stuff,* December 1st, 2018. https://www.nzherald.co.nz/hawkes-bay-today/news/harakeke-casket-now-available-for-whanau-in-hastings/PMAD3G5XZSO6VJOHZLJQNGON7E/.

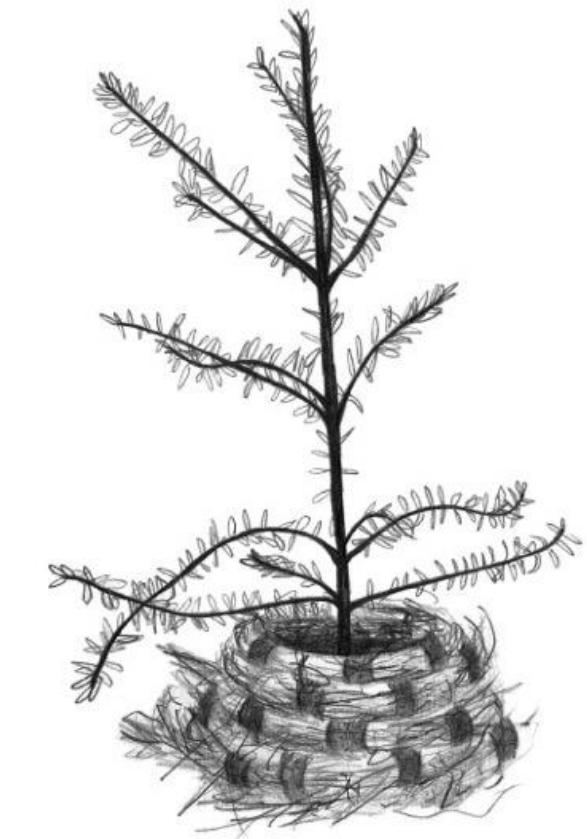
Uwajeh, Patrick Chukwuemeke, and Ikenna Stephen Ezennia. "The Socio-cultural and ecological perspectives on landscape and gardening in Urban Environment: A narrative review." *Journal of Contemporary Urban Affairs* 2, no. 2 (2018): 78–89.

"Uwhi Trial Healing More Than Just Rotorua Te Arawa Lakes." Scoop Independent News, February 23rd, 2022. https://www.scoop.co.nz/stories/AK2202/S00456/uwhi-trial-healing-more-than-just-rotorua-te-arawa-lakes.htm.

Vannini, Phillip, Dennis Waskul, Simon Gottschalk, and Toby Ellis-Newstead. "Making sense of the weather: Dwelling and weathering on Canada's rain coast." *Space and Culture* 15, no. 4 (2012): 361–380.

Walker, Erana T., Priscilla M. Wehi, Nicola J. Nelson, Jacqueline R. Beggs, and Hēmi Whaanga. "Kaitiakitanga, place and the urban restoration agenda." *New Zealand Journal of Ecology* 43, no. 3 (2019): 1–8.

Appendix I - Textile catalogue



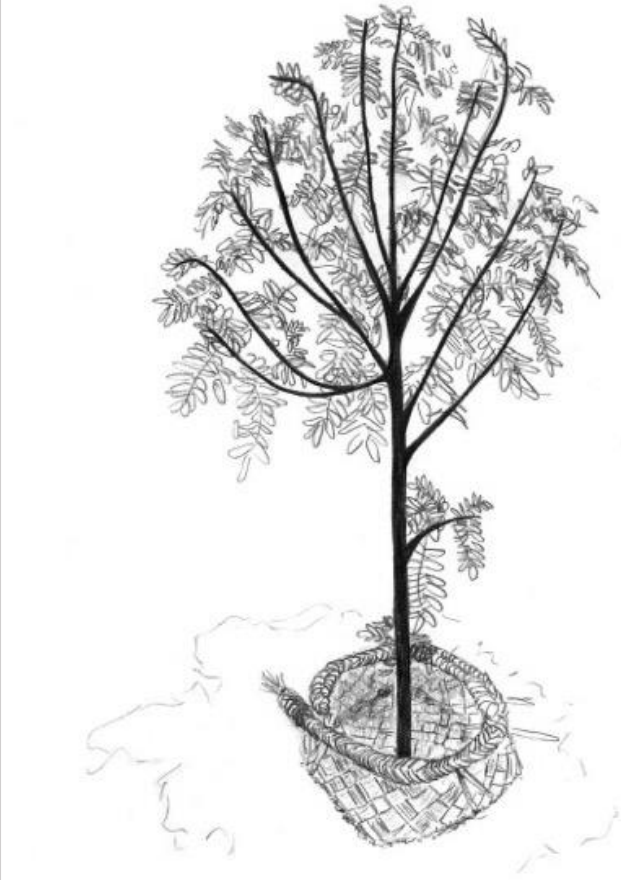
textile structure: *dried birds nest* 17.05.23, IMG_2762.jpeg

created: 18.04.23

technique(s): vertical plain weave (90 degrees) angling inwards

functional qualities: shade for soil, anchor/support for lower branches

aesthetic qualities: circular repetition and rhythm, creating open volume and flow around the plant stem, contrast between fresh and dried leaves



textile structure: *kete basket braid* 06.06.23, IMG_2916.jpeg

created: 16.04.23

technique(s): plain weave (90 degrees), braiding (45 degrees), 3-ply plaiting

functional qualities: ground cover, minimize unwanted plant growth, additional cover offered through chopped mulch being added into the kete

aesthetic qualities: circular boundary/composition creates a sense of stability, complementary forms and shapes

03/04/23 IMG_2099.jpeg

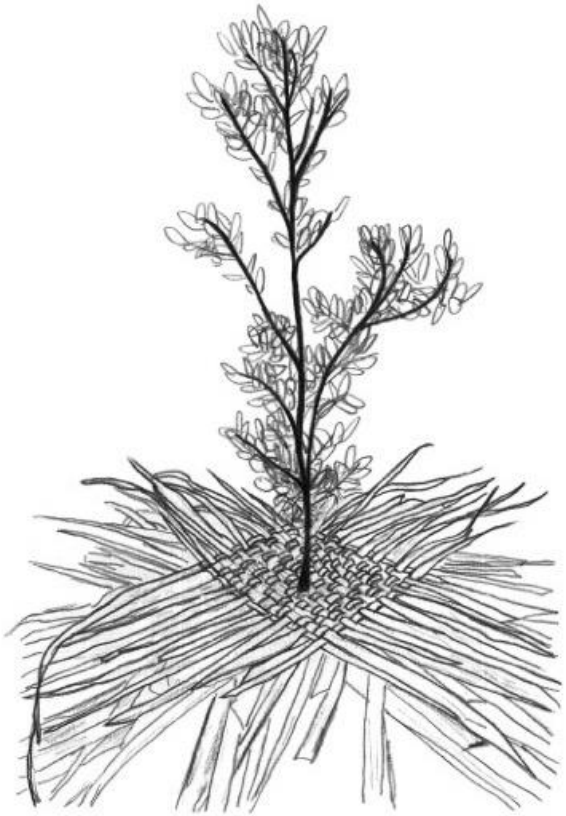
textile structure: *mulch chips* 24.06.23, IMG_2526.jpeg

created: 03.04.23

technique(s): Not applicable to textile techniques, however, excess harakeke material not used in the creation of other textile prototypes was chopped up and placed on the soil, as a way to utilise all the harvested plant leaves

functional qualities: ground cover, minimize unwanted plant growth

aesthetic qualities: smaller scale repetition of shape, assymetric composition of textures and colours



08/04/23 IMG_2192.jpeg / IMG_1304.jpeg 20/02/23

textile structure: *multilayered matting* 11.06.23, IMG_2961.jpeg

created: 20.02.23

technique(s): plain weave (90 degrees)

functional qualities: ground cover, minimize unwanted plant growth, alternating the angle(s) of the mats to ensure maximum coverage

aesthetic qualities: contrasting layers, angles, and lengths of material

27/04/23 IMG_2593.jpeg

textile structure: *upside down kete* 17.04.23, IMG_2863.jpeg

created: 27.04.23

technique(s): vertical plain weave (90 degrees), plaiting (45 degrees)

functional qualities: diffuse sunlight, enhance moisture retention in soil

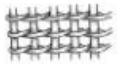
aesthetic qualities: contrasting widths and angles of material, distinct transition between techniques

24/04/23 IMG-2524.JPG

textile structure: *vertical woody fence* 11.06.23, IMG_2957.jpeg

created: 18.04.23

technique(s): twining



functional qualities: reducing wind impact on the plant

aesthetic qualities: open volume and taller height, rotation around the plant stem, moving upwards and around the branches/leaves, re-defining the space

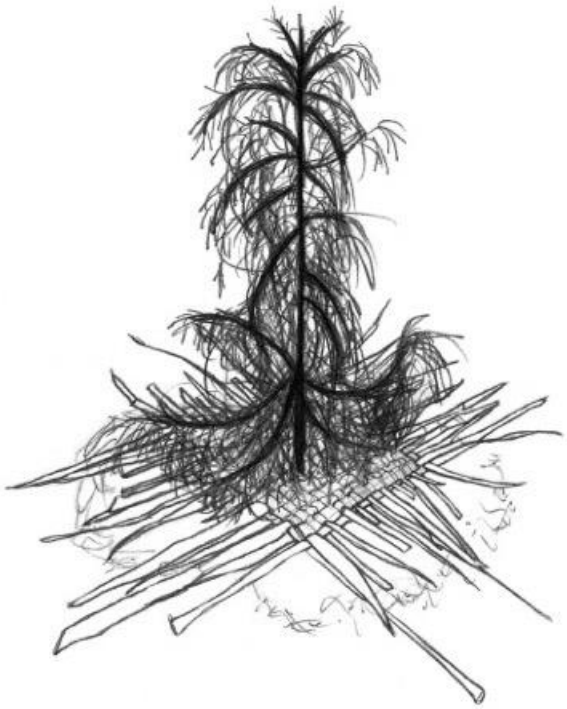
textile structure: *woven 'S' mat* 08.06.23, IMG_2934.jpeg

created: 16.04.23

technique(s): plain weave (90 degrees)

functional qualities: ground cover, minimize unwanted plant growth, shelter/habitat for worms as the soil is damp and moist, and a feeding spot for birds, as their beaks can poke through the softened, bottom layer of the mat directly into the soil

aesthetic qualities: flow and movement of the mat suggest 'growth' up the plant stem



25/02/23 IMG-1394.jpeg / IMG-1323.jpeg 20/02/23

textile structure: *woven mat* 08.06.23, IMG_2937.jpeg

created: 20.02.23

technique(s): plain weave (90 degrees), 3-ply braiding

functional qualities: ground cover, minimize unwanted plant growth

aesthetic qualities: dark geometric shapes/forms/patterns encompassed by contrasting, fresh, green, drooping plant leaves