

Kahikatea tū i te uru

*Exploring connections between
trees, people, culture, biodiversity,
and climate change in Ōtaki*





He Kupu Whakamihhi

Ki a koutou te whare tūpuna kua whakarauika mai hei tautoko i te kaupapa, tēnei te mihi kia koutou.

Kei ngā tupu o te ngāhere, kei ngā wai tuku kiri o te ira tāngata, kei ngā kaitiaki o te taiao, ngā uri o Papatūānuku tēnei te mōkai āwhina e mihi kau nei ki a koutou katoa.

Kia huri tōku mata ki te pae o Tararua.
ki ngā awa o Ōtaki, o Waitohu e rere kau ana, ki te moana nui a Kahe Te Rau o te Rangī.
Whakawhiti atu ki te waewae Kāpiti o Tara rāua ko Rangitāne.
Kia hoki mai ki uta
Ngā marae me ngā hapū o te rohe.
Mai Waitapu ki Rangataua
Mai Mīria te Kākara ki Kukutauaki
Whakawhitia te moana o Raukawa, ki Wairau, ki Whakatū
Ko te rohe pōtae o Ngāti Raukawa te au ki te tonga
Ngā uri o Mahinārangī rāua ko Tūrongo
Tēnei te mihi ki a koutou katoa.

He roimata ua, he roimata tangata, he roimata e kore e mārokengia e te rā. Ka mihi ki a koutou kua takitahi atu rā ki te paki o Mataariki, koutou kei te ngākau mau tonu. Kei te whāea e Pauline e kui moe mai rā, e hoki atu ki ō tūpuna, ki to tātou whāea a Papatūānuku e takoto nei, te whenua a o tūpuna.

Kia hoki mai ki a tātou ngā kokonga o te whare, tēnā koutou katoa.

He Kupu Whakataki

This project started with what we thought was a simple question. We wanted to understand better “How do trees absorb carbon?” And then, we began to think about ways to communicate the answer so that more of us could make a connection between trees that we know and love, and see and touch, and the changing climate. In short, we wanted to find a way to look at a tree, or a group of trees, and understand in a meaningful way how much carbon dioxide they absorb over their lifetime. For instance, how many years do how many trees have to grow before the emissions from a single flight have been taken out of the atmosphere?

The project also grew out of an opportunity, offered by the Friends of the Ōtaki River, to use the tree planting site that they work at as a case study and site location. While appreciative of the invitation, the project leader, Rhian Salmon, lives in Ōtaki and was aware of the need to talk with local iwi and mātauranga experts before carrying out any such locally-focused project. To that end, she contacted Pātaka Moore and Caleb Royal, from Te Wānanga o Raukawa, with whom she had worked with previously. They provided much to think about, including caution to tread carefully, speak with the right people first, and to continually engage with local iwi.

We also grew the idea with friends and colleagues in Ōtaki and around the motu. Te Pūnaha Matatini Centre of Research Excellence agreed to support two Master’s students and a cultural advisor, and we put together a team comprising experts in mātauranga māori, tree ecology, citizen science, visual design and climate change.



He Kupu Whakataki

The role of local cultural advisor was filled by Watene Kaihau (Ngāti Raukawa), who Rhian knew as a fellow ‘kindy parent’ and who also had Caleb’s support. Watene provided sage advice and friendship throughout. Most importantly, he facilitated conversations with Tungia Kaihau (Ngāti Maniapoto), Kuini Rikihana (Ngāti Raukawa, Te Āti Awa) and Mark and Pauline Wilson (Ngāti Raukawa) (see 24-25). Each of these amazing people were generous with their time and knowledge and helped us to better understand the historical and cultural context of the region.

Most importantly, we learnt the importance of people being at the heart of everything. He tangata, he tangata, he tangata. In addition, Professor Huhana Smith (Ngāti Tukorehe, Ngāti Raukawa), one of the project supervisors who also lives near to Ōtaki in Kuku, hosted a ‘kai and kōrero’ half way through the project as an opportunity to check in on how our ideas were developing and to receive feedback. A range of people were invited, and it was attended by Tungia Kaihau, Kuini Rikihana, Pātaka Moore, and Aroha Spinks. As he left, Pātaka said, “you have all the right people in the room”.

The project’s focus expanded to include climate change communication, biodiversity, and environmental design. And for Watene it was always about people. The questions became broader and the project, initially given a working title of “Trees + Carbon” quickly became “Trees + People [+ Carbon]”. The name it finally found, Kahikatea tū i te uru, reflects how trees interconnect and strengthen so many things: people, culture, air, water, insects and birds to name a few that we studied in this project. While this project was not initially driven by community needs, it evolved to become more community-oriented than we ever anticipated and is so much richer for it.

Within this booklet, we're excited to share with you a summary of the two Master's research projects at the heart of the project. Katerina Armstrong (Ngāi Tuhoe, Ngāti Kahungunu) completed a Master of Design from Toi Rauwhārangī, College of Creative Arts, Massey University. She explored how spatial design can be used to reveal the importance of conserving and reconnecting ngāhere through a Te Ao Māori lens. A summary of her research can be found on pp. 18-27, while her beautiful graphics can be seen throughout this booklet. Vicky Gane completed a Master of Science (Science in Society) from Te Herenga Waka—Victoria University of Wellington. Her research focused on better understanding and communicating the biodiversity and carbon held in and around trees near the Ōtaki River. A graphical summary of her insights can be found on pp. 28-39.

While these may sound quite different, the two projects interwove like a braided river, or the roots of a kahikatea tree, most importantly meeting whenever we met with local kuia and kaumātua to better understand the land, people, trees and stories where this work was being carried out.

This research was carried out in Ōtaki, has been formally handed to a representative of Ngāti Raukawa ki te Tonga, and has been shared at a range of local community events, including an exhibition at Māoriland. However, it's also important that the theses themselves are returned and accessible to the local community. We hope that they provide helpful insights and ideas for anyone thinking about the connection between trees, people and climate, and are thankful for the opportunity to carry out this work in this rohe.

We thank everyone who has supported this project, provided guidance, re-direction, suggestion and encouragement. In order to ensure this information remains accessible and available, this booklet, along with the two Masters theses, will be available online as well as through the Kāpiti Coast District Libraries and library at Te Wānanga o Raukawa. The authors, and their supervisors (see end) are also happy to remain available for a kōrero about this research into the future.

Rārangi Kaupapa

This is a summary of research that explored the relationship between Trees, People, Culture, Biodiversity and Climate near the Ōtaki River.

This mahi emerged from an inclusive space where diverse backgrounds and perspectives wove together to form a strong kete of knowledge. It responds to our increasingly fragile ngāhere ecosystem by exploring ways of understanding and communicating the importance of native trees through a science, design, and te ao Māori lens in the local area of Ōtaki.

The project name, Kahikatea tū i te uru, strength in numbers, anō nei he toa takitini, reflects the strength gained in a gathering in which everyone supports each other as seen in the root system of a grove of kahikatea. It resonates with the intentions and the outcomes of this research, including insights into:

- How the tikanga of kaitiakitanga protects Papatūānuku and her cloak of life, working alongside insects and birds;
- How insects and birds thrive when trees grow together closely;
- How people grow together when reconnected with their whenua, their wai within their taiao, and in the case of this project also through the planting of trees;
- How carbon dioxide is more likely to be absorbed and to stay out of the atmosphere when trees grow together and in doing so support a new ecosystem;
- How different disciplinary research methods can intertwine and strengthen each other.

The name has an additional meaning for us as we regularly greeted a kahikatea each time our core team met at Harūatai Park for a regular hīkoi and wānanga.

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Rārangi Whakapapa

In 2021, Vicky and Katerina started their research projects. Vicky, who joined with an interest in biodiversity and conservation, started a Master of Science at Te Herenga Waka—Victoria University of Wellington. Katerina, who joined with an interest in Spatial Design and mātauranga Māori, started a Master of Design at Toi Rauwhāangi, College of Creative Arts, Massey University.

Throughout 2021 these collaborative projects intertwined, similar to a braided river. With the central anchor being whanaungatanga, building relationships rooted in manaakitanga, māhaki and tikanga. By meeting with Ngāti Raukawa whānau over hīkoi, cups of tea, kai, and small hui to whakarongo, listen, and share kōrero, it illuminated similar desires towards restoring the whenua for future generations. Walking through remnant ngāhere, while listening to stories of how these taonga sites once were, was an important step towards understanding the depth of connection.

Alongside these moments of intersection, Vicky counted insects and birds, calculated the potential amount of carbon stored in tree plots of different ages and related this to potential amounts of carbon dioxide removed from the atmosphere. She also thought about how this information could be communicated and shared back to the community. Katerina explored the local historical and cultural aspects of the ngāhere and used visual design to conceptualise what a new future could look like, where green areas connect to form rich corridors for ngā manu and tangata whenua.

In June 2022, after completing both Master's projects, the team and community came together to plant 800 trees near Chrystalls Bend. This was done alongside a planting led by Ngāti Raukawa rōngoa expert Joanne Hakaria.

Katerina's project culminated in an exhibition, ceremony and kōrero at Māoriland in October 2022, at which time both theses were also gifted to Ngāti Raukawa Kaumātua, Rawiri Rikihana. In addition, Vicky volunteered with the Friends of the Ōtaki River every week throughout her project and publicly presented her research in Ōtaki, in October 2022 (FOTOR AGM) and August 2023 (Energise Ōtaki).

Master Projects Timeline:

The graphic on the right represents the timeline of Katerina and Vicky's research projects.

The left side focuses on design-based work, and the right side focuses on science-based work, while the center represents moments of coming together.

2021

Huitanguru
February

Poutūterangi
March

Paengawhāwhā
April

Haratua
May

Pīpiri
June

Hōngongoi
July

Hereturikōkā
August

Whiringa-ā-nuku
September

Whiringa-ā-rangi
October

Mahuru
November

Hakihea
December

Kohitātea
January

Huitanguru
February

Poutūterangi
March

Mahuru
November

Design

Science

2020

00 DEC Initial kōrero with Pātaka and Caleb

2021

- 01 10/02 First hui with the proposed tree planting/ climate change research team
- 02 05/03 Hui with Huhana, Rhian and Jo and site visit drive through Chrystalls Bend
- 03 15/03 First Arohaehae (Peer feedback session)
- 04 18/03 Hīkoi together around the Chrystalls Bend site
- 05 18/03 First hui with Pātaka Moore at Nga Purapura
- 06 26/03 Māoriland Film Festival
- 07 07/03 Community tree planting day with Friends of the Ōtaki River group
- 08 13/04 Trees and Climate team wānanga
- 09 02/06 First Friends of the Ōtaki River group meeting
- 10 03/06 First meeting and hīkoi with Watene at Haruātai reserve
- 11 09/06 Wānanga with Watene's mum, Tungia
- 12 12/06 Restoration Day Conference, Wellington
- 13 17/06 Second Arohaehae (Jen Archer and Sven Mehzoud)
- 14 18/06 He Pito Mata Awakening the Potential - Early Career Research Wānanga
- 15 22/06 Hīkoi with Vicky around estuary and awa
- 16 30/06 Speaking at the Masters Centre for Science in Society trees wānanga
- 17 01/07 Trees wānanga talking about projects
- 18 02/07 Hīkoi with Huhana at Haruātai
- 19 09/07 Tree planting with Conservation Volunteers Group at Ohariu Valley, Wellington
- 20 18/07 WAI 262 Kia Whakapūmau - Online Digital Symposium led by the claimant whānau
- 21 24/07 Tree planting at Watene's whānau whenua
- 22 28/07 FOTOR planting with Watene
- 23 28/07 Visit Watene's whenua and whānau planting
- 24 06/08 First meeting with Kuini Rikihana
- 25 01/09 Third Arohaehae (Georgina Stokes and Jen Archer)
- 26 07/09 Interview with Katerina and Vicky by Jonathan from Te Pūnaha Matatini
- 27 24/09 Meeting Joanne Hakaria at Chrystalls Bend
- 28 01/10 Site visit to Denton's Bush
- 29 01/10 Meeting with Joanne Hakaria and Watene at Chrystalls Bend
- 30 06/10 Hui and hīkoi with Watene to practice mihi and karakia and discuss Tikanga
- 31 11-19/10 Bulk of tree measuring work and bird counts
- 32 15/10 Rongoā planting near Chrystalls Bend
- 33 16/10 Contract work planting trees in Waikanae
- 34 22/10 Hui at Huhana's whare
- 35 08/11 Te Pūnaha Matatini Mahia to Mahi retreat
- 36 09/11 Tree sampling with Vicky and Watene
- 37 23/11 Meeting with Pauline and Mark Wilson from Katihiku Marae
- 38 29/11 Meeting with Georgina Stokes and Stuart Foster about digital tools and technology
- 39 01/12 Final Arohaehae (Anna Brown)
- 40 13/12 Centre of Science in Society wānanga
- 41 16/12 People/nature connections group meeting
- 2022
- 42 20/01 Soil sampling and putting out pitfall traps
- 43 23/01 Collecting pitfall traps + bird counts
- 44 21/02 Hui and team catch up in Ōtaki with site visit and Waihōanga
- 45 04/03 Collecting and learning about sound recording gear from Isabel Castro
- 46 04/03 Testing recording at Turitea stream
- 47 08/03 Wānanga with Tungia
- 48 08/03 Hīkoi at Haruātai with Watene and Kuini
- 49 08/03 Working together in Ōtaki
- 50 09/03 Recording audio at Haruātai and Ōtaki awa
- 51 09/03 Hīkoi on south side of river
- 52 18/03 Visit to Kāpiti Island + Recording audio
- 53 29/03 Testing the projection and audio in spaces with Jason, Jo and Huhana
- 54 09/05 Examination presentation
- 55 22/08 Matariki tree planting gathering
- 56 29/09 Exhibition in Māoriland hub
- 57 26/10 FOTOR AGM presentation
- 58 14/11 Exposure Exhibition Massey University

2022



Te Whakatō Rākau

We came together with a wide range of community members during Matariki (2022) to plant young rākau near Chrystalls Bend. This included students from Ōtaki School, members of the Rōngoa planting group, Friends of the Ōtaki River and colleagues from Auckland, Massey and Victoria Universities. The day began with a karakia, mihi to the whenua, awa and, mana whenua, and ended with acknowledgements and kai.



Species

List of the main species planted. These species would have originally grown in the area and are chosen for their ability to survive in a new planting area.

Kahikatea	Makomako/wineberry	Tī kōuka/cabbage tree	Akeake
Tōtara	Karamū	Kōhūhū/pittosporum	Kapuka/griselinia
Tītoki	Mānuka	Whauwhaupaku/five	Akiraho
Tarata/lemonwood	Kānuka	finger	Koromiko
Mānatu/ribbonwood	Māhoe/whiteywood	Mingimingi	Horoeka/
Houhere/lacebark	Kōwhai	Taupata	lancewood

The trees were generously donated by the Friends of the Ōtaki River, who nurtured the seedlings, prepared the ground, and continue to care for the growing trees.






Planting trees

Photography Series by
Katerina Armstrong

Ōtaki

Key

- River side walkway 
- Coast 35 bike path 
- Native vegetation 



LAKE WAIRONGOMAI
LAKE KAHUWERA

WAITOHU STREAM

NGĀ TŌTARA
ŌTIPUA PARUĀUKU



TAINUI

Katerina study site



RAUKAWA

HARUĀTAI

ŌTAKI RIVER TRAIL

RAHUI RD

COAST 35

ŌTAKI RACECOURSE

QUARRY

CHRYSSTALS BEND
WALKWAY

*Educational tree planting area
Vicky and Katerina's study sites*



Whakapapa o te ngāhere

**An explorative discussion and process
of understanding ecological and
cultural fragmentation through design**

A SHORT SUMMARY OF THE THESIS BY
KATERINA FRENCH ARMSTRONG

TOI RAUWHĀRANGI MASSEY UNIVERSITY



Whakarāpopoto

Ko te Whakapapa o te ngāhere¹, is an explorative discussion and process of understanding ecological and cultural fragmentation through kōrero, hīkoi² and spatial design.

Over the young colonial history of Aotearoa, rapid deforestation, land alienation and land alteration has significantly changed the whenua and the relationship between tāngata, rākau and the ngāhere that once cloaked Māori lands. Through a cross-institutional and interdisciplinary collaboration, this project expands ways of communicating the embedded values and relationships between native rākau, tāngata and whenua within the rohe of Ngāti Raukawa ki te Tonga, Ōtaki.

Guided by the overarching principle of whakapapa, we acknowledge that this relationship extends beyond rākau to the pre-colonial whenua, dominant with puna wai Māori³ and kōreporepo ngāhere. Out of the process of centering whanaungatanga, hīkoi and kōrero of past and future visions arose the spatial design themes of visualisation, immersion and experience. These forms have come together through a temporary installation that guides people through an immersive visual karakia expressing whakapapa and mauri, preceding a series of visualisations that represent three familiar sites within Ōtaki that connect wai and rākau. Overall, through a reflective and iterative process that centres tāngata and rakāu, this mahi explores how the intrinsic nature of kaupapa Māori and spatial design can complement one another. The aim is to add to the growing body of communication and engagement models that can consider climate change complexities and highlight the need for expanded ecological restoration.

Research question

How can spatial design be used to reveal embedded narratives and activate conversations, while revealing the importance of conserving and reconnecting ngāhere through a Te Ao Māori lens?



Rākau

3D visualisation by
Katerina Armstrong

1.

Whakapapa translates to 'lay flat'. In the context of this project its meaning spans from a framework of understanding identity, genealogy, layers and interconnections. Ngāhere refers to both the forest and the many binding connections within. Shortland, T. (2011). *Cultural Indicators for Kāuri Ngāhere*.

2.

Hīkoi translates to 'walk' and is acknowledged as an important part of research when working closely with Māori and the land. Smith, S. M. (2007). *Hei whenua ora: hapū and iwi approaches for reinstating valued ecosystems within cultural landscape*. Doctoral dissertation.

3.

Rāwiri, H. A. (2018). *Tahi ki a Maru : water, fishing and tikanga in Ngāti Raukawa ki te Tonga. Ōtaki : Te Tākupu, Te Wānanga o Raukawa*. (See Katerina's thesis for the full reference list).

Ko wai au?

**Na Toi raua ko Pōtiki te whenua
Na Tūhoe te mana me te rangātiratanga**

**Ko Maungapōhatu tōku maunga
Ko Ōhinemataroa tōku awa
Ko Mataatua tōku waka
Ko Waikirikiri tōku marae
Ko Tūhoe Ko Ngāti Kahungunu ōku iwi
Ko Hāmua me Nāti Mura nā hapū
Ko Mika Ko Warikihi Stevens te whānau
Ko Doug raua ko Wendy ōku mātua
Ko Katerina ahau**

No hea au?

As someone who grew up far from their ancestral homeland, living on the edges of different worlds, I've often felt disconnected from my Māori roots. However, observing my mother's journey to discover our tīpuna has shown me the immense strength it requires. While not having immediate whānau nearby has made it challenging to navigate, over the last five years I've tentatively set off on a journey of uncovering the diverse threads that weave together the intricate tapestry of our whakapapa.

Sitting in the carry pack of a conservation biologist (aka my dad) it's been mentioned that before I could walk or talk, the ngāhere and unfolding life within was something I gazed upon in awe. Later down the track, that feeling has not changed. No matter where I am in the world, surrounded by rākau and ngāhere is where I feel most at home. While my whakapapa connects me to Ngāi Tuhoe of Te Urewera and Ngāti Kahungunu of the east coast, I was born and raised in the rohe of Rangitāne in the Manawatū. I grew up beneath the maunga of Tararua and Ruahine in an entanglement of suburbia, farmland and ngāhere. Manawatū means 'heart standing still', named by the great grandson of Kupe, Haunui-a-nanaia who felt this after traversing Te Āpiti (Manawatū Gorge)⁴. I'm familiar with that stillness. However, the expanse of kōreporepo and ngāhere that would have laid over the lands as far as the eye could see is now characterised by a broken tapestry of remnants. The maunga stand bare and dry in the distance, scattered with stands of pine trees that will be felled. Soon, new ones will begin to grow. Native ngāhere spreads over the folds of valleys and inclines that are less accessible to man.

Through the journey of this mahi I have wondered, "If these ecosystems are severely separated from our everyday experience, how can we feel connected to them?" If we're not connected to them how could we be driven to protect and conserve them?



Woven

A wire-frame 3D model
representing connections
by Katerina Armstrong

4.

Smith, H. (2017).
*Porirua ki Manawatū
Inquiry Inland Waterways
Cultural Perspectives
Technical Report.* Te
Rangitāwhia Whakatupu
Mātauranga Ltd.



Whanaungatanga

As manuhiri we were initially unfamiliar with the rich, significant, and poignant narratives and history of te awa o Ōtaki. Through this mahi it was therefore important to proceed with māhaki and manaaki. With the continual support of Watene Kaihau as a cultural advisor and Huhaha Smith, Jo Bailey and Rhian Salmon as supervisors we created and welcomed moments of kanohi ki te kanohi, face to face connections. We feel incredibly grateful to have shared kōrero with Tungia Kaihau and Pauline Wilson who passed away after this project was completed.

Ngāhere 09/06/21

After going on a number of hīkoi that introduced us to the remnant ngāhere, Watene soon suggested a visit to the whenua of his whānau. Before setting foot near their whenua, it was important to meet with his mother, Tungia Kaihau, a notable kuia from Ngāti Maniapoto Waikato. We arrived with nothing but ourselves and arms full of kai. After getting to know our backgrounds, potential challenges, and intentions of our proposed research projects, Tungia guided us through the teardrop wānanga for us to move together with a clear understanding. It was deeply inspiring to hear the intricate stories and kōrero tuku iho from a kuia that has been shaping her worldview and mataūrangā for years.

Moana 06/08/21

During our meeting with Kuini Rikihana, a wandering fig tree weaved across the ceiling above us as we discussed various topics, from Te Rauparaha to Ōtaki. Moments beforehand, Watene, Rhian, Vicky and I had gathered at the moana and recited the karakia, *Whakataka te hau*, while absorbing the sounds of the crashing waves. As we moved towards a nearby whare close to where the awa and moana meet, we were greeted with a faint karanga.

Kuini Rikihana, a respected individual of Ngāti Raukawa and Te Āti Awa descent, holds importance in Ōtaki, making it special for us to meet her. Our conversation revolved around the awa and ngāhere, as she swiftly recalled her family's stories of the abundant mahinga kai and resource systems of Lake Waiorongomai and Haruātai reserve. As we listened, we were reminded of the profound impact of lost cultural practices and connections.



During these pivotal moments of connection and relationship building I wondered how elements from each site, hīkoi and kōrero could act as inspiration for reimagining, restoring and reconnecting different ngāhere. Through photography, collage, 3D modeling, creative writing and sound recording I aimed to create a body of research that both celebrated and illuminated the rich narratives intricately woven within our shared whenua.

Hui 22/10/21

About halfway into the duration of Vicky and my Master's we organised a hui to have kai and kōrero over rākau. The gathering took place in Huhana's whare in Kuku, a location known for hosting numerous hui. The ambiance of the room was welcoming and familiar, despite my initial uncertainty around sharing my thoughts and design work. Beginning with a karakia and mihi, I acknowledged Ngāti Tukorehe, Raukawa's descendants, those that were no longer with us and those that had made the journey to be a part of the kōrero. Although I did not grow up immersed in te reo Māori, it is through mihi, karakia, and whakataukī that I feel most connected. I then proceeded to outline the journey we had embarked upon, sharing the visualisations and concepts that had emerged from it. This prompted a discussion on the profound bond between whānau and the ngāhere, and how visual imagery can effectively communicate this concept.

Kōreporepo 23/11/21

Just south of Ōtaki township, Katihiku Marae is located amidst remnants of kōreporepo and farmland. The construction of stopbanks on the northern side of Ōtaki Awa has led to significant changes in the size, direction, and flow of the channels, leading to increased erosion on the southern banks. During a meeting with Pauline and Mark Wilson of Katihiku Marae, they discussed this, as well as their ongoing work towards restoring the lands surrounding their marae. They envision a future where they can either return to or provide their future generations with the opportunity to live closer to their marae. This view aligns with those of other whānau we have connected with. There is an urgency to reconnect, restore and conserve the mana of these taonga ecosystems as they provide a natural source of flood prevention and identity.

Whakaahua

Through the format of an exhibition, the aim of *Whakapapa o te ngāhere* is to provide both a physical and multimedia experience. An animated projection that responds to a soundscape acts as a “visual karakia” while the narrative of place is grounded by a series of banners that visualise three sites: Waimanu Lagoon, Waitohu Awa, and Ōtaki Awa. This community-focused exhibition aims to foster ongoing dialogue between tangata whenua and the wider community regarding the stories embedded within the land. In late 2022, I had the opportunity to exhibit my installation alongside Lorna Tawhiti (Ngāti Raukawa) and other Toi Matarau artists in Māoriland. Sharing this installation as a culmination of the work, conversations, and journeys we have undertaken with the people of Ōtaki was a significant part of the process.





Display
Photos from presenting
in Toi Rauwhārangi



Trees, people and the environment

**Using a tree planting site to engage a
local community with climate change
and biodiversity issues**

A SHORT SUMMARY OF THE THESIS BY
VICKY GANE

TE HERENGA WAKA—VICTORIA UNIVERSITY
OF WELLINGTON



Whakarāpopoto

Research question

How can an understanding of site-specific environmental benefits of community native tree planting be used to stimulate engagement and communicate about global issues, specifically climate change and biodiversity loss?

Planting native trees is an important response to climate change and biodiversity loss in Aotearoa New Zealand, but it can be difficult to relate trees in the ground to measurable benefits. This study uses a community tree planting site next to the Ōtaki River to measure site-specific benefits. The study has a transdisciplinary approach, with expert input from a variety of fields, including biological science, community engagement, science communication, mātauranga Māori, and design. A participatory method was used, with the author volunteering within the community tree planting group Friends of the Ōtaki River, and meeting with local Māori in Ōtaki as part of community engagement.

In the scientific component of the study, carbon in trees and soil was estimated. Biodiversity values were measured by counting birds and invertebrates at the site. The trees have been planted over a 20-year period, and changing biological values were measured between planting sites of different ages. This research showed a complex ecosystem with many elements influencing carbon sequestration and biodiversity. Ecosystem processes such as canopy closure and habitat fragmentation were more influential for biodiversity than the size of trees.

In order to communicate the complexity of carbon absorption and biodiversity at the site, key messages were developed about the range of ecosystem services provided by trees. These included ecosystem processes in different stages of growth, the long timeframes required for carbon to accumulate and associated importance of large trees, and that native biodiversity is related to the amount of tree cover. Communication outputs were developed as examples of ways these messages could be shared in a way that related directly to the community in Ōtaki.



Pepeha

Ko Trish Gane tōku māmā

Ko Chris Gane tōku pāpā

Nō Te Matau-a-Māui ahau

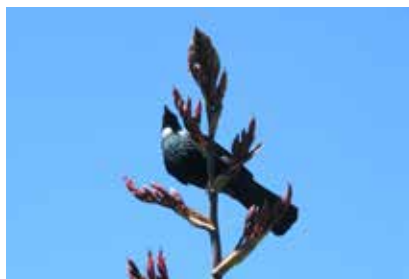
E noho ana ahau ki Te Papaioea

Ko Vicky ahau e mihi ana ki a koutou katoa

Ko au

I was attracted to this study because of a keen interest in ecosystems and biodiversity, and also the chance to address environmental issues in an applied way. A Pākeha New Zealander from Hawke's Bay, an early interest in Māori culture led me to study te reo Māori to exam-level at high school. After completing a Bachelor of Arts (English) degree, I spent eight years living and working overseas before returning to Aotearoa to work as a driver/guide on bus tours throughout the country. Sharing my passion about the natural and cultural heritage of Aotearoa with tourists eventually inspired me to complete a Postgraduate Diploma in Science (Conservation Biology).

Coming from this varied background, the transdisciplinary and applied approach of this research appealed to me, while the diverse components matched many of my interests. Studying the environment not as data, but in a more holistic way with consideration of community and cultural setting, feels like a much more effective approach for considering global environmental issues.



Kōkako, Tūi and Te Mata Peak

Photography Series by
Vicky Gane

Mahi

Methods

Basing my study in the context of the Ōtaki community was an important part of my study. I attended many of the meetings with mana whenua detailed earlier in this booklet, as well as researching the historical and social context of the river and the changes made to its form. I was also a regular participant with the Friends of the Ōtaki River volunteer group, attending their meetings held on Wednesday mornings. This enabled an understanding of how the trees planted along the river sit within a social context.

To measure the benefits of trees in terms of carbon sequestration and biodiversity, I used a western scientific approach. I was able to estimate carbon using specialised equations based on species and plant size, with measurements taken from plantings of different ages along the river. Soil carbon was tested in a lab from samples I took from underneath trees of different ages. As an indicator of biodiversity values, I counted both birds and invertebrates within plantings at various ages. Birds were measured using 5-minute bird counts, a common monitoring method in Aotearoa that records numbers and species of birds seen and heard in five minute snapshots. I set pitfall traps (containers with liquid, set into the ground), and used a microscope to identify all the invertebrates caught after three nights.

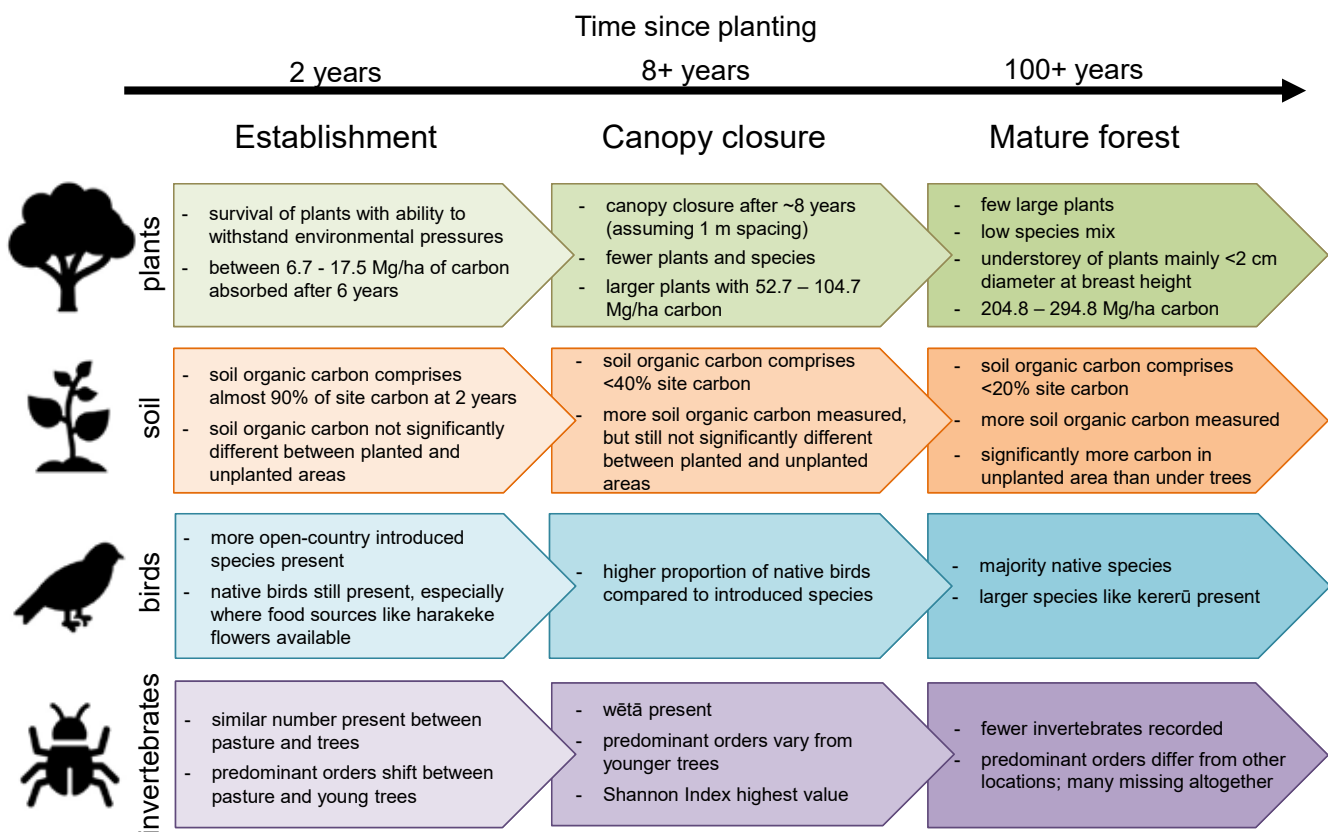
Results

The results showed that differences in carbon and biodiversity were mainly connected to differences in ecosystem processes related to key periods of plant growth: during establishment following planting, the point at which trees had become big enough to form a closed canopy, and a mature forest. These differences are summarised in the info-graphic on the opposite page.



Key messages from these results:

- Trees provide a range of services, of which carbon sequestration is only one.
- Planting sites are successional. Different stages of growth play a key role in overall forest development.
- Trees grow and absorb carbon at different rates, but even young trees can improve biodiversity values.
- It takes time for carbon to accumulate, requiring mature trees and undisturbed soil.
- Biodiversity values of birds and invertebrates are affected by tree cover.
- Large trees are important for both carbon and biodiversity.



Kōrero Pūtaiao

Since my Master's was in Science in Society, there was an expectation that I would not only explore the science, but also potential ways to engage the local community with these results. The key message emerging from my research was that **biodiversity values change as the trees grow and provide different ecological conditions and habitat depending on their size**. One possible way to communicate a narrative about these processes and the changes that tree succession caused for birds and invertebrates was through a series of signs. These would be located surrounded by trees that demonstrate these processes.

Were this to lead to real signs, the actual text would need to be developed as a collaborative process with local iwi, to sit within the cultural context of Ōtaki. The signs would need to be bilingual and feature information about the history of the river and people. As a way for people to learn about the ecological processes, I developed example key messaging that could go on signs next to growing trees.



Ōtaki River map

Created in ArcGIS Pro by
Vicky Gane using base
from Nov 2020 (Esri, 2021)

Example messages

1 Near river walkway:

- Beginning with a karakia and mihi to the land, river and Ngāti Raukawa ki te Tonga, with space to acknowledge the cultural context and connections to the land.
- The Ōtaki River used to be a braided river that was surrounded by wetlands and swamp forest.
- The river was altered as a mitigation for flooding in Ōtaki township (post-colonisation). Trees have been planted as part of flood protection, to enhance the environment and support recreational use along the river.

2 Near young trees:

- Establishing that trees can need a lot of time and care as when trees are young they are vulnerable to drought, rabbits, and different soil conditions.
- Hardy nursery species are important to provide protection for other trees and to start community processes.
- Even at an early age, trees will start to absorb carbon, and different insects and birds are supported.

3 Near larger trees with canopy closure

- A closed canopy means that different invertebrates can survive e.g. wētā.
- Soil carbon will accumulate under leaf litter.
- Seedlings that need shade to grow can become established such as nīkau and tawa.
- It takes time for carbon to accumulate, requiring mature trees and undisturbed soil.
- Wider variety of trees means more food available to attract birds, also more chance that birds will spread seed.

4 Carbon and trees summary:

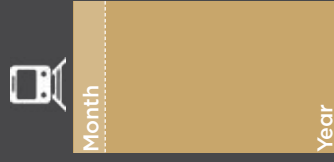
Lastly, a sign would feature a carbon graph in the 'educational tree planting area' (see graph on next page) detailing the comparison between activities in Ōtaki compared with how much carbon would be absorbed by the surrounding trees. This sign would also make clear that a forest ecosystem is vital for some species to survive.



Carbon and Trees

Everyday activities release carbon dioxide (CO₂). As more CO₂ is released into the atmosphere it increases and intensifies global climate change.

Trees take up CO₂ and the carbon becomes their branches, roots and leaves as they grow. By removing CO₂ from the atmosphere, trees help to reduce the effects of climate change.



Key



Ōtaki - Wellington return train trip, 5 days a week



Ōtaki - Wellington return trip medium car, 5 days a week



Return flights for one adult



Average annual household emissions (including power, transport and waste)



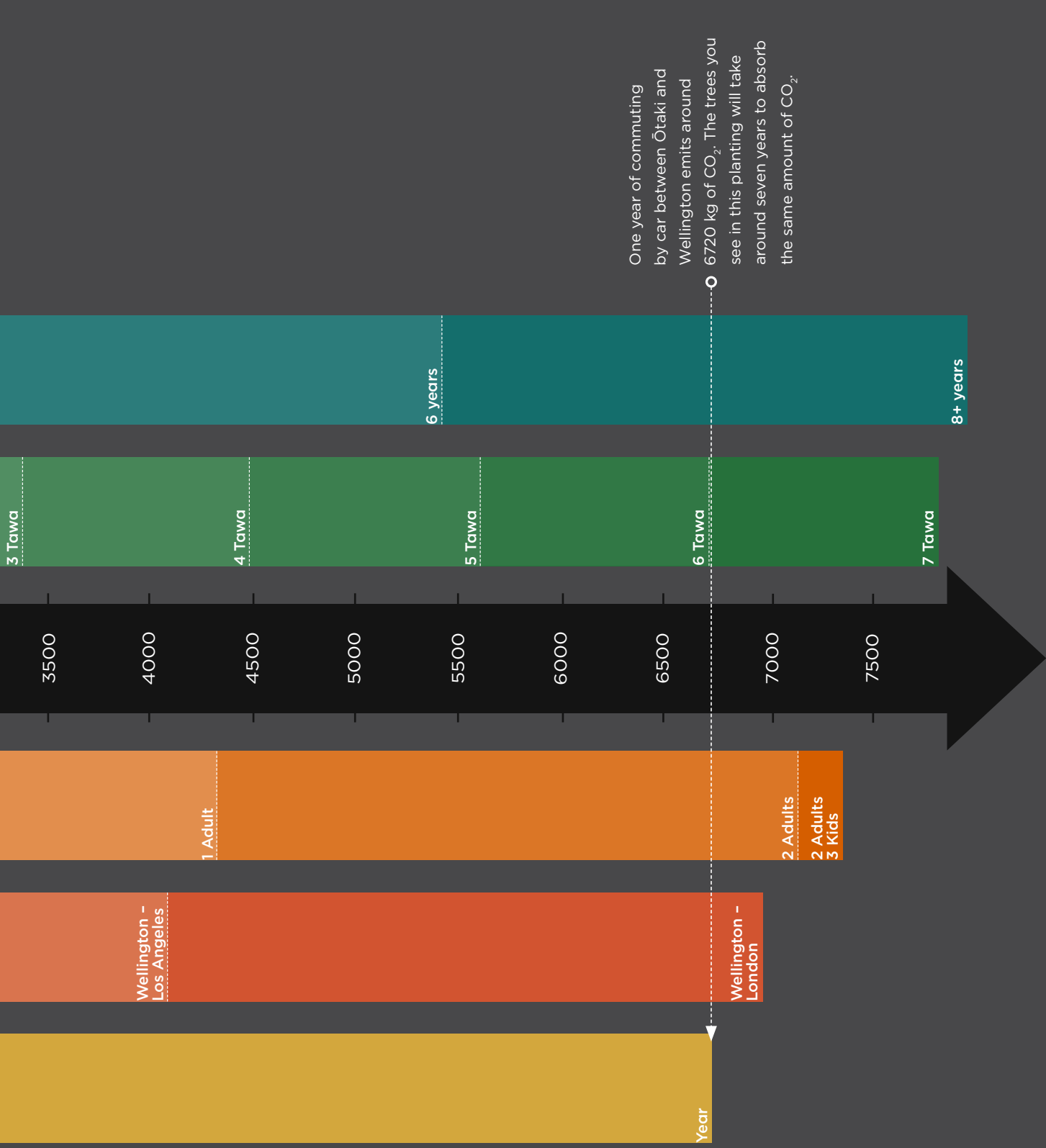
Mature tawa tree (70+ years) based on growth within a forest ecosystem



Native tree plantings along Ōtaki River average size 1,300 m²

One return flight between Wellington and Rarotonga emits around 1003 kg of CO₂. This amount would take one tawa tree 70 years to absorb.

Canopy trees, such as tawa, hold large amounts of CO₂, but they require the shelter and growth conditions of a forest in order to survive and reach maturity. The trees around you will grow over decades to develop a forest ecosystem, where CO₂ is held within the soil and plants, while providing a rich habitat for native biodiversity.



One year of commuting by car between Otaki and Wellington emits around 6720 kg of CO₂. The trees you see in this planting will take around seven years to absorb the same amount of CO₂.

Raranga Whakaaro

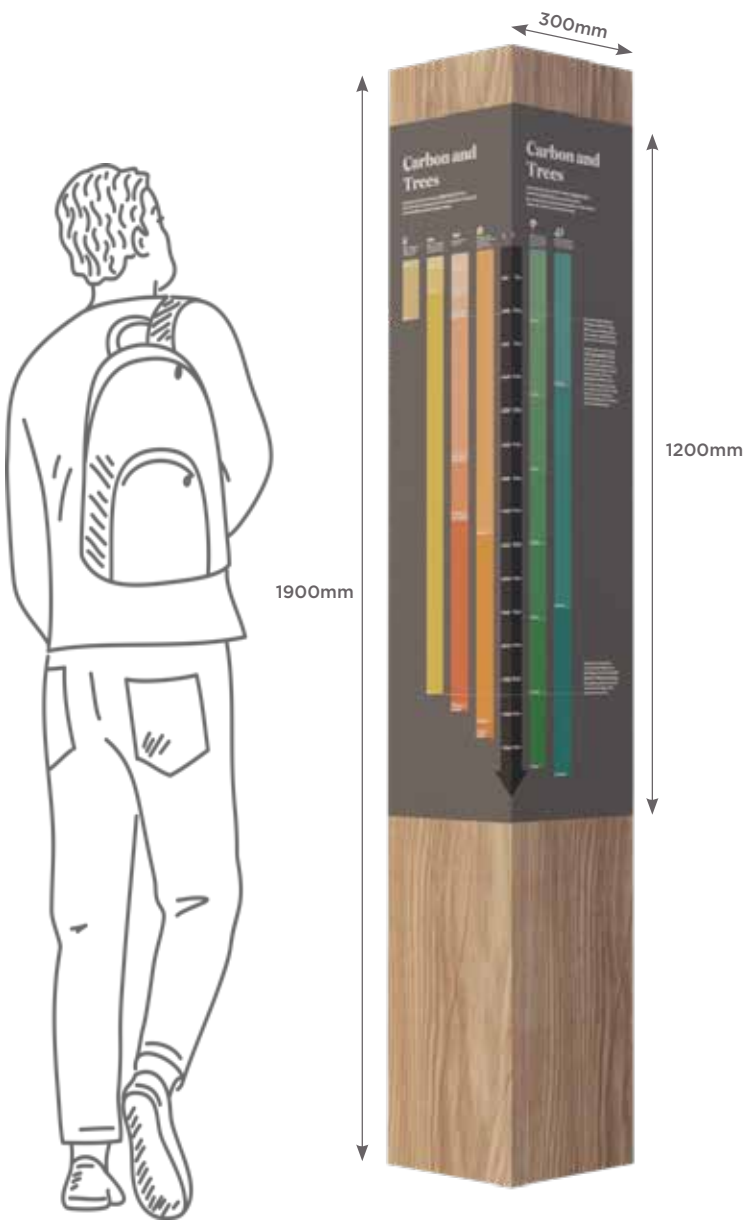
The insights and outputs of our research came together to develop a public signage concept. The objective was to enhance public understanding and appreciation of the area's history from the stories of the local people of Ngāti Raukawa and the rich cultural significance and environmental processes occurring within the growing trees. Each of these signs would need to be co-created with mana whenua, and be bilingual. They would be designed in a way that blends in with the natural environment while also each focusing on an aspect such as culture, climate or biodiversity.

Our understanding of the local history and the strong connection between the people of Ngāti Raukawa and the river, as well as the surrounding land from the Tararua ranges to the sea to Kāpiti Island, developed through conversations with whānau who belong to the local hapū. It was the beginning of an ongoing conversation and commitment to working with mana whenua while remaining open to new connections and ideas.



Sign concept

Illustrations licensed from
Adobe Stock and graphics
by Katerina Armstrong





He Kupu Whakakapi

Tungia, thank you for sharing your wisdom, your wānanga, your insights, your time, and your generosity, and for enabling us to have a safe passage on this journey: culturally, spiritually, and physically. You were a true teacher, reminding us always to acknowledge, invite and listen to our ancestors before all else. May your wisdom continue to be learnt and shared and in this way keep your mahi alive.

With thanks to Kuini Rikihana, Pauline and Mark Wilson, Tungia Kaihau, Watene Kaihau, Phil Cowan, Māoriland, Maakarita Paku, Pātaka Moore, Caleb Royal, Huhana Smith, the Friends of the Ōtaki River, Greater Wellington Regional Council, Te Pūnaha Matatini, Te Herenga Waka—Victoria University School of Science in Society and Toi Rauwhāangi College of Creative Arts Massey University.

*Ehara taku toa i te toa takitahi
engari he toa takitini*

*My strength is not the strength
of one but of many*

Tima

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