TE KAAHU O TUAWHENUA

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CONTENTS

Manaaki Whenua Landcare Research

Overview

Manaaki Whenua Landcare Research is New Zealand's main environmental research institute specialising in the management of land resources. Key issues being studied include:

- Protecting distinctive plants and animals
- Controlling the worst weeds and pests
- Maintaining the quality of soils
- Minimising greenhouse gas emissions
- Reducing the environmental impacts of cities and businesses

Manaaki Whenua is one of nine Crown Research Insititutes established in 1992 from a reorganisation of Government-funded research and employs over 400 staff at nine locations throughout New Zealand.

Over the last 3 years Manaaki Whenua has been developing a research programme with the Tūhoe Tuawhenua Trust (see the figure below). Trust board members have actively contributed to setting research directions, developing funding proposals and initiating research with Manaaki Whenua on trust forests. The research will investigate activities that could provide multiple benefits to the trust beneficiaries:

- Forests generating economic benefits from timber production
- Improved environmental benefits through strategic weed and pest control
- Enhanced satisfaction from utilising mātauranga Māori on rongoā, mahinga kai and whakairo;
- Utilising assets for the social development of people.

Funding: FRST (Foundation for Research, Science and Technology)

For more information about the overall project.
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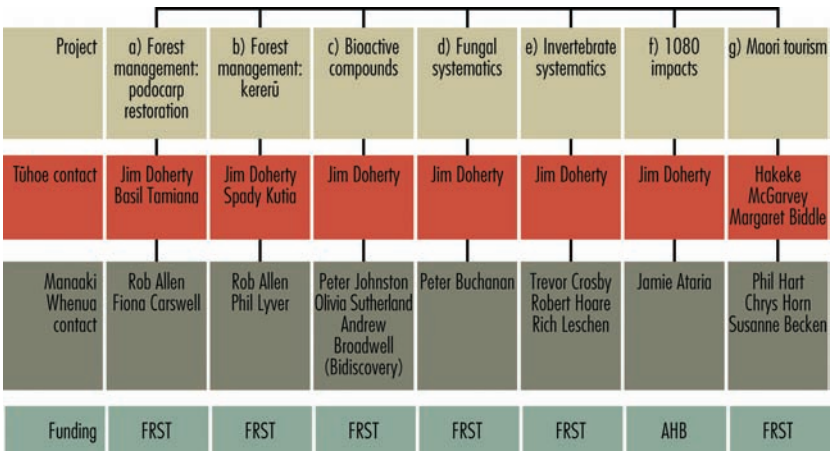
Relationship between Manaaki Whenua and Tūhoe Tuawhenua Trust: 2003 – 2004



Regeneration of Tuawhenua forests

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Tim McManus
Basil Tamiana
Ruatāhuna/Ngāputahi people:
Katiana Tamiana
Myra Doherty
Manaaki Whenua:
Rob Allen
Fiona Carswell
Susan Wiser
David Wardle
Sarah Richardson
Melissa Brignall-Theyer
Matt McGlone
Te Whare Wānanga o Awanuiārangi:
Tūhoe students are employed for scientific field experience

(Top) Frank Weko (Te Whare Wānanga o Awanuiārangi) estimates the density of the canopy without having to look upwards! Credit: Susan Wiser

(Bottom) Jim takes a turn at recording numbers while Susan Wiser (Manaaki Whenua) measures the diameter of a rimu seedling. Credit: Trent Hiles

WHY ARE WE DOING THE RESEARCH?

The Tuawhenua Trust has been concerned that some key species of the forest have not been regenerating as well as they used to. In particular, there seem to be fewer individuals of the podocarp species (toromiro, rimu, mātai, tōtara and kahikatea) and those that are present don't appear to be that successful at becoming big trees. This may be related to the decrease in numbers of kererū that feed on the fruits of these tree species. It may also be related to the logging last century that removed most of the potential parent trees and increased the dominance of tawa in the canopy. This might have reduced the light at the forest floor and may have also given tawa an advantage in access to soil nutrients.

WHAT DOES THE RESEARCH INVOLVE?

The research involves 2–3 intensive field trips a year (1–2 weeks each). During these trips a selection of the people involved base themselves in Ruatāhuna and travel to forest sites each day. Someone from the Tuawhenua Trust or the Ruatāhuna community goes to the field site every day. A survey of seedlings present in three areas of Tuawhenua forests has already been completed. We measured the number of podocarp and tawa seedlings present at 15 places within the Kopuhaea, Kakānui and Waituhi forest blocks. We then attempted to relate the presence of these seedlings to a range of factors such as altitude, nutrients available, amount of disturbance, and presence/absence of other plant species. We have also tagged about 200 rimu, toromiro and tawa seedlings in the Waituhi forest block and will measure their growth over the next 5 years. We will be able to see if the seedlings in the light have a better chance of becoming canopy trees than the ones in the shade. We are also going to look at the growth of tawa trees around stumps of podocarps that have been felled. By taking a small core from the tree trunk and examining the rings we can tell if they grew a lot after the competing podocarp was removed (this does not damage the tree in any way). In the future we hope to look at the number of seeds present in the forest and how many of these are being eaten by rats. We are also going to look at the effect of climate on tawa – will there be an increase in tawa dominance at Ruatāhuna in the future if the climate continues to warm?

Funding: FRST (Foundation for Research, Science and Technology)

Jim Doherty (Tuawhenua Trust) and Larry Burrows (Manaaki Whenua) call in extra help so they can reach right round the kahikatea to measure its diameter. Credit: Sarah Richardson

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Reversing the decline in kererū in "ngahere o Tuawhenua"

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Tim McManus
Basil Tamiana

Manaaki Whenua:
Phil Lyver
Graham Nugent
Keven Drew
Caroline Thomson
Morgan Coleman
Kerry Borkin
David Ramsey

Te Whare Wānanga o Awanuiārangi:
John Hauwaho

(Top) John Hauwaho (Te Whare Wānanga o Awanuiārangi) takes time out in front of a giant cabbage tree on the daily trap round. Credit: Keven Drew

(Bottom) Tūhoe taxis - Basil Tamiana and Caroline Thomson take the easy (dry) way home. Credit: Phil Lyver

The TūhoeTuawhenua Trust indicated to Manaaki Whenua that they would like assistance to restore kererū populations in their ngahere. In an attempt to halt the decline of kererū, the Tuawhenua people placed a rahui on the harvesting of kererū. However, the rahui assumes human harvest is a major contributor to the decline in kererū numbers. Unfortunately, paihamu, rats, and other predators such as stoats are known to take kererū eggs, chicks, and adults.

When working with the environment it is important to understand the relationships between animals in the ngahere. It is possible to make a problem worse if you alter the ecosystem in some way without understanding how that change will affect other species in that ecosystem. As part of our mahi, we want to measure the predation rate of kererū kohanga by paihamu and rats. We want to know when there are certain numbers of paihamu and rats about, and what is the likelihood that a particular paihamu or rat will visit a kererū nest and take whatever is in the kohanga. Once we know this, we can predict the optimal level of paihamu and rat control necessary to reduce predation to acceptable levels. We want to avoid wasting scarce resources on over-control of a pest species when it may not be required and could be spent on other issues.

Using light radio transmitters attached to the backs of adult kererū we will locate nest sites. Paihamu and rats in a 16-ha area around the kererū nest will be caught alive and tagged with very small electronic tags under their skin, then released. We will also place passive infrared transponders (PITs) and infrared video cameras at 2–4 kererū nests each year. The PITs will record which particular paihamu or rat visits the nest and when, and the video cameras will record what actually happens when these animals encounter the nest. Determining the area and centre of each paihamu and rat's home range is also important. We will do this a number of ways:

1. Attaching global positioning devices or satellite collars on paihamu;
2. By recapturing the paihamu and rats on a trapping grid; and
3. Using DNA taken from individual paihamu and rats and extracted from their faecal pellets we find around the grid.

Funding: FRST (Foundation for Research, Science and Technology)

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Ngā mātauranga kererū o Tūhoe Tuawhenua

He taonga te kererū. Credit: Jamie Newman

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Tuawhenua Tangata Whenua:
Spady Kutia
Manaaki Whenua:
Phil Lyver

We would also like ngā mātauranga kererū o Tuawhenua kaumatua to play a central role in this restoration project. The study of mātauranga is extremely important for a number of reasons. Tūhoe Tuawhenua have a vast amount of knowledge about the ngahere and the birds that live in it – generations of it – which would be impossible to gain in the short time span of a scientific study. Mātauranga can help us better understand how kererū numbers have changed over the years; did numbers decline gradually or was it very sudden and this may offer answers or suggestions about why changes in numbers occurred, and provide science with "clues" to follow.

Your knowledge about factors important for the survival and breeding of kererū can also help us build a better project. In similar research, such as the Rakiura Māori "Kai Mau Te Tītī Mo Ake Tōnu Atu" project, mātauranga provided insights into what was happening with the tītī that would have taken the scientific research decades to find out about. The mātauranga will help the Tuawhenua Trust develop a management plan for the restoration of kererū that is appropriate for the Tuawhenua people. It can also give scientists a different way of looking at conservation and management. For example, it may be more acceptable to you if certain decisions are made according to your tikanga.

We would like to record this knowledge in interviews with kaumatua. A Tuawhenua person would conduct the interviews in Te Reo Māori, or English, if preferred. Spady Kutia has kindly offered to conduct these interviews with kaumatua. We would like to ask questions like:

1. What were kererū numbers like in the past?
2. When did kaumatua notice a change in kererū numbers?
3. Have kererū numbers changed with the arrival of other animal species like the paihamu?
4. How has the ngahere changed over the years and has this affected the kererū?
5. What foods do the kererū prefer to feed on at certain times of the year?
6. What trees are important for the kererū, and how?
7. Have other factors like climate affected kererū, and if so, how?

Mātauranga is also different from science because it includes a spiritual component. It is considered wrong to separate the local knowledge of plants and animals from the spiritual context because this can alter the meaning and interpretation of the knowledge. We would like to ask questions about the practice of harvesting because much of the knowledge related to kererū, such as respecting the mauri of kererū, is linked to the harvest. This knowledge will help the Tuawhenua Trust build a kererū management plan that conforms to your tikanga. We are certainly not interested in the numbers of kererū harvested now, or in the past.

Funding: FRST (Foundation for Research, Science and Technology)

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Tūhoe microbes

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Manaaki Whenua:
Peter Johnston
Biodiscovery:
Peter Wigley
Andy Broadwell

WHY ARE WE DOING THE RESEARCH?

One of the aims of the Tuawhenua Trust is to maximise the economic value of its forests, but to do this in a way that does not threaten the future of those forests. Our approach is to survey the fungi and bacteria in the forests for compounds that might be useful in the control of agricultural pests and diseases. Many of the most powerful products used to control diseases, weeds, or insect pests have been developed from compounds first discovered in fungi and bacteria. Discovery of these compounds presents no threat to the forests. Small, handful-sized samples of litter and soil are taken to the laboratory, and invisible fungi and bacteria within the samples are grown out onto special, jelly-like substrates in petri dishes. Any compounds produced by the fungi and bacteria are tested for their potential to attack insects and other fungi that cause agricultural diseases. If we manage to find a compound that no one else has yet discovered, and that is safe to use, it may have potential to be developed as a new medicine, fungicide, or herbicide. Although the chance of finding a compound with commercial value is very small, if one is found, a proportion of its value is returned to the Trust.

WHAT DOES THE RESEARCH INVOLVE?

Most of the fungi tested come from about 200 litter samples collected across the Tuawhenua Trust forests each year. In the first year of this project we isolated more than 1000 kinds of fungi or bacteria. Although some of these formed compounds with activity against economically important pests or pathogens, they were all compounds that have previously been discovered by other people.

We also collect fungi that grow within the living leaves of trees in the forests. The fungi from living leaves are biologically very special – they cause no disease and each fungus is found usually in only one kind of tree. The tree and the fungus are adapted to live together without harming each other. We are sampling these fungi from a site close to the track beside Mangapae stream. Tiny pieces (about the size of a quarter of a rimu leaf) of leaf from rimu, toromiro, mataī, kahikatea, tōtara, and kānuka are used to gather the fungi. At the motel, on the same day the leaves are picked, the leaves are cleaned, then small pieces of leaf are put on to petri dishes. We sampled 2400 leaf pieces during a visit in October. Soon we will be able to select a range of different species for testing at the Biodiscovery lab in Parnell, Auckland, over the next 6 months or so.

Funding: FRST (Foundation for Research, Science and Technology)

(Top) One of the fungi growing in a petri dish. Credit: Peter Johnstone

(Bottom) Motel room lab, growing fungi in petri dishes after gathering them from the forest. Credit: Peter Johnston

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Urewera fungi

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Manaaki Whenua:
Barbara Paulus
Peter Johnston
Te Whare Wānanga o Awanuiārangi:
Tūhoe students will be provided scientific field experience

(Top) Barbara Paulus collecting samples in the forests at Tarapounamu
Credit: Peter Johnston

(Bottom) Two species of "paint-splash" fungi on wood in the forest near Te Waiiti. Credit: Peter Johnston

WHY ARE WE DOING THE RESEARCH?

The long-term health of forests requires recycling of nutrients within the forest. Fungi are important to this process – returning nutrients from fallen leaves and wood to the soil, and also in helping trees to take up these nutrients. In addition, the fungi of the forest floor are important as food for litter-inhabiting insects. The insects in turn provide food for some of the forest birds. Logging a forest changes the kinds and numbers of fungi present in the forest. This change could affect the efficiency of nutrient recycling, the ability of the forest to regenerate, and the kinds of insects available as food for birds.

The huge numbers of species of forest fungi mean that it is difficult to measure changes in the species present. There is no information on the impact of logging on forest fungi in New Zealand – logging may increase or decrease the numbers of species, or it may change the kinds of species present. In this project we are trying to get an indication whether fungal diversity differs between logged and unlogged sites in the forests around Ruatāhuna. If we find there is a difference, then its consequences on the long-term health of the forests, and whether the differences decrease as the logged forests become older, will need to be looked at.

WHAT DOES THE RESEARCH INVOLVE?

Our survey of fungal diversity requires four intensive field trips a year (1–2 weeks each). Four sites are being surveyed, two in unlogged forests near Tarapounamu and Mangapae and two in logged forests near Tarapounamu and Te Waiiti. At each site a series of 25 m x 2 m plots have been established. For practical reasons, we are restricting the survey to fungi growing on pieces of wood between about 2 and 5 cm diameter that have fallen on the ground. At each visit all fungi seen on these pieces of wood are collected from eight plots from each site. Back at the motel in the evening we try to grow in culture all the fungi collected, then we dry the fungi. The cultures and the dried specimens are used to name the fungi. Naming the fungi takes several months' work back in the Manaaki Whenua lab at Tamaki, Auckland. We also collect about 10 short pieces of wood from each plot and take these back to the lab. The pieces of wood are kept moist and we expect that more kinds of fungi will start growing from them. Additional samples of litter and soil (each sample about a handful in size) are collected each month by Jim Doherty from other parts of the Tuawhenua Trust forests. These are sent to an overseas laboratory for analysis of the species present. To fund this research, the cultures are also examined for their ability to produce compounds that could be useful as new medicines.

The first set of samples was collected in October. We gathered more than 500 fungi, and about 200 are growing in culture. The results from these samples will tell us whether the approach we are taking will work. Because this is a new approach to comparing fungal diversity, we do not know if it will work, and we may need to modify what we do as we go along. The next set of samples will be gathered this summer, early in February.

Funding: FRST (Foundation for Research, Science and Technology)

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Iwi research on 1080 in plants of cultural importance

WHO'S INVOLVED?

Tuawhenua Trust:
Jim Doherty
Lake Waikaremoana Hapu Restoration Trust:
James Waiwai
Neuton Lambert
Manaaki Whenua:
Jamie Ataria
Lincoln University:
Shaun Ogilvie
Te Whare Wānanga o Awanuiārangi:
Michelle Lambert

(Top) He whānautahi tātou! Members of the research team and other interested parties. Right to left; Neuton Lambert, Jim Doherty, Dave King (Department of Conservation), Jamie Ataria, Shaun Ogilvie, Michelle Lambert, John Hauwaho (Te Whare Wānanga o Awanuiārangi). Credit: Shaun Ogilvie.

(Bottom) The author with a sample of the pikopiko and kāramuramu. Credit: Shaun Ogilvie.

The poison 1080 is used in New Zealand for the control of introduced pests, including possums and rabbits. One method used to apply 1080 is aerial application from a helicopter of cereal or carrot baits containing 1080. Tangata whenua throughout Aotearoa have particular concerns about the distribution of 1080 baits during aerial operations. The potential risk to people of being poisoned by eating kai (food) or rongoa (medicinal) plants was identified as of particular significance to the people of Ngāti Ruapani of the Lake Waikaremoana area.

In August 2003 a research team consisting of the people mentioned above embarked on research to investigate this issue.

We began with a hui at the Whakamarino Lodge with members of the Lake Waikaremoana Hapū Restoration Trust, the community and Department of Conservation to identify two culturally important plants that may be affected by aerial 1080 bait application. From this hui, pikopiko and kāramuramu emerged as two appropriate species to use. With the assistance of Neuton's amazing local knowledge of a site south of the Panekirei Range was located where both plants were present.

Cereal 1080 baits were laid at the base of selected pikopiko or kāramuramu plants (one bait per plant). Pikopiko shoots and kāramuramu leaves and shoots were removed immediately after the bait was laid, then at 3, 7, 14, 28, and 56 days later. These samples were taken to Manaaki Whenua in Lincoln where the amount of 1080 was measured.

No 1080 was measured in any of the pikopiko samples despite the fact that almost all of the 1080 had moved out of the bait after 56 days. However, low levels of 1080 were measured in some of the kāramuramu plants. The maximum concentration measured was 5 parts per billion and this occurred at 7 days after the bait placement, and this had returned to zero after 28 days. To give some idea of how much 1080 we found in the kāramuramu leaves and shoots, if we had 1 gram of kāramuramu and divided it into 1 billion pieces then only five of those pieces would have 1080.

So does this amount of 1080 represent a poisoning risk to us? Based on medical information relating to how much 1080 a person would need to eat to get a fatal dose, we concluded that there is negligible risk of poisoning based on the amount of 1080 measured in leaves and shoots from kāramuramu plants that had been exposed to one cereal bait.

However, questions raised that we were not able to address in this research include:
"How is the rongoa capability of the kāramuramu affected by these levels of 1080?"
"Will 1080 from baits affect other types of plants that we use for kai or rongoa (e.g. puha, watercress, t-ikauka)?"

Funding: AHB (Animal Health Board) with logistical support from the Department of Conservation

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Jim and Basil like to keep their socks dry while in the bush. Credit: Phil Lyver

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