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Overview from Manaaki Whenua

The relationship between the Tūhoe Tuawhenua Trust and Manaaki Whenua remains active in promoting research to improve management of the lands administered by the Trust for its beneficiaries. It has been a difficult year as some of our funding sources have ended and we have only been partially successful in acquiring new sources so far. One successful funding application will involve some fieldwork around Ruatāhuna to sample wood from tawa and rimu trees in January 2014 to find out how fast these trees grow. These new data will help the Trust refine their timber harvesting management plan. In this issue we report on our ongoing podocarp seedling work, and the challenges of trying to find moa remains.

Contact: Sarah Richardson

Phone (03) 321 9788

Email richardsons@landcareresearch.co.nz

THE TŪHOE TUAWHENUA TRUST IN 2012/2013

Prepared by Brenda Tahi, Executive Trustee

Nga mihi ki a koutou nga rangatira o nga whenua o te Tuawhenua me nga hoa mahi, kai tautoko hoki i nga mahi e hangai ana ki te kaupapa o te Tuawhenua. Te mamea me te pouri hoki mo nga mate o te wa, o tatau kuia, koroua hoki kua wehe atu ki te po, kua wehe atu i te kitenga kanohi. Haere, haere, haere atu ra koutou...

This year was another busy one – all about further development in our businesses, in our environment and in our community for the ahi-kaa of Ruatāhuna. We provide a summary of key highlights from our 2012-13 year, which pertains largely to our work in people development and biodiversity management. In this edition, alongside reports on key research for us by Landcare Research, we feature our two commercial developments in honey and timber production - from business operations to markets and relevant research. We also feature Nicole Bancroft as the inaugural recipient of the Manaaki Whenua Scholarship.

ISSN 1176-8096 (Print)
ISSN 1178-3400 (Electronic)



Landcare Research
Manaaki Whenua



We refer you to our website www.tuawhenua.biz for more information and copies of our published reports.

We take this opportunity to acknowledge our Chair, Tahae Doherty in his national role advising on Maori issues for the Environmental Protection Agency (EPA). This new group is known as 'Te Herenga', which brings together Maori resource managers, practitioners and experts on kaitiakitanga, commercial and other interests in nature resource and environmental management. Te Herenga works alongside the EPA to lift the effectiveness of Maori engagement in its decision-making.

ORANGA MO NGA WHĀNAU O TE TUAWHENUA PROJECT

We gained support from Te Puni Kōkiri for this project that aimed to assist whānau of Ruatāhuna to take up job and business development opportunities to 'make a living' that would move them to self-reliance and well-being. This project engaged most (80 households) of the whānau of Ruatāhuna in a process to identify aspirations, assess issues and create plans for them to make a living in the future. The project found that whilst most whānau are benefit dependent in Ruatāhuna, they have astonishing aspirations for creating their own employment mainly because no-one else is doing much about it. It's no surprise that the people of the Tuawhenua want to make a decent living and that is

the reason why we as a Trust are working so hard against the odds to create jobs in Ruatāhuna for the ahi-kaa.

The project also produced an integrated strategy for "Industry and People Development in the Tuawhenua" which outlines issues and opportunities for the growth of the Ruatāhuna economy. This strategy sits alongside support the Trust has provided for the planning undertaken by the mārua of Ruatāhuna that included the facilitation of the Hui Taumata held in December 2012.

JOB CREATION AND TRAINING

The Trust has created a number during this past year, 2 new full-time jobs as at 31 March 2013, as well as several casual and project jobs during the year. All positions have been filled by ahi-kaa and all staff have been trained in competencies required for their jobs. Whilst a number of the jobs created were not full-time permanent jobs, this year saw the Trust delivering on our objective to create jobs for ahi-kaa that in turn lifts economic growth and prosperity in Ruatāhuna.

We have identified a wide range of training needs in Ruatāhuna through our Oranga mo nga Whānau o Te Tuawhenua Project. Our programme of training and development is driven by two objectives – for staff to be successful in their jobs and to contribute to generally developing the capability of the



Tahae Doherty with other members of Te Herenga – the national Maori advisory body that works alongside the Environmental Protection Agency.



Kerewai Morunga (Project Manager) and Kirituia Tumarae (Project Analyst) are working away here on the plans developed by whānau for making a living in the future.



Tuawhenua people. Our training and development initiatives this year involved:

- Business development seminars, expo for training and development and computer skills training for Ruatāhuna
- Training and development in logging, milling and grading, beekeeping, honey extraction for operational staff
- Business development, project management, business strategy and GIS mapping for trust office staff

BIODIVERSITY MANAGEMENT

We completed an assessment of and a plan for improving the biodiversity of the Tuawhenua with assistance from DOC during the last year. Overall the assessment found that although much of our ngahere still stands as indigenous forest, it is infested by a range of pests such as possums, rats, stoats and deer. We found that regeneration is poor under our forest, and a number of birds and other species are either extinct or under real threat. Our plan for restoration in the short-term will focus on podocarps, pest plant control as well as the protection of specific sites at Onini and Rangiora.

ENVIRONMENTAL ISSUES

We completed an assessment of environmental issues and pests in Ruatāhuna with the support of the Bay of Plenty Regional Council. This assessment highlights the lack of basic services in



Margie Biddle from Waiariki Polytech takes a workplace training course organised by the Tuawhenua Trust for advanced learning in the suite of programmes in Microsoft Office.

Ruatāhuna particularly around sewage and refuse disposal. It also assisted us in developing a plan for the eradication of a range of pest plants.

RONGOA RESERVE

During the winter of 2012, we established a reserve for rongoa alongside the Ruatāhuna Stream. This project will be completed in 2013 with signage and interpretation for the range of rongoa plants gathered from our ngahere and planted out into the reserve.



Our biodiversity assessment found that the 'School Bush' is the only example of forest in our whole region that is not being browsed by deer, cattle or horses. It contains emergent rimu over tawa forest, with many rimu greater than 30 m tall. The dense subcanopy has hinau, pate, hangehange, whauwhaupaku, and Cyathea smithii.



In contrast, this site to the north of the junction of Mahakirua Stream and Whakatāne River, shows the damage that is done under tall podocarps by browsing and even hard grazing – there is just no undergrowth.

ERADICATION OF BLACKBERRY AND OTHER PEST PLANTS

We continued our campaign to eradicate blackberry in the Tuawhenua – there's no doubt that it is a huge job. Some of this work was completed as a contract with the Whakatāne District Council; some of it with land-owner paying; and some through assistance from the Ruatāhuna Farm, Bay of Plenty Regional Council and DOC. All in all, we are encouraged by the change in our landscape as we begin to get rid of this weed.

During the summer we also worked with the local and regional councils and the Farm to begin the blitz on broom, gorse, kuiki and old man's beard.

SURVEY OF PIGS FOR TB

The Trust facilitated a survey of wild pigs for the incidence of TB in our region for the Animal Health Board. Hunters in the Tuawhenua region brought in the heads of their wild pig catches for the Trust to submit for TB testing. No TB was detected in the survey and the work continues into 2013 as part of the TB monitoring programme of the Animal Health Board.

WHO'S INVOLVED:

Jim Tahae Doherty (Chair), Ngapūtahi
Brenda Tahī (Executive Trustee), Ruatāhuna
Korotau Tamiana, (Trustee), Ruatoki
Doris Rurehe, (Trustee), Ruatāhuna
Tane Rua, (Trustee), Ruatāhuna
Anthony Te Kurapa, (Trustee), Ruatāhuna
Hekenoa Te Kurapa, (Trustee), Ruatāhuna

The Tūhoe Tuawhenua Trust and Manaaki Whenua

We have now been working closely with Landcare Research for over a decade and we have together completed many research projects, enjoyed many excursions into our ngahere and debated many points in long hui into the night over the years! We further enhanced our relationship with Landcare Research through two initiatives in 2012 – our organisations collaborating in strategic planning and a scholarship to promote research in forest ecology.

STRATEGIC PLANNING

In December 2012, our organisations joined up for a strategic planning exercise in Ruatāhuna. We hosted Richard Gordon, Chief Executive and senior managers Rob Allen and Peter Millard from Landcare Research for the planning session and involved all of our trustees. We covered a wide range of issues including our collaboration and research to date, current projects and opportunities for collaboration for the future. .

THE MANAAKI WHENUA SCHOLARSHIP

In 2012, we established the Manaaki Whenua Scholarship in conjunction with Landcare Research to promote training and development of Tuawhenua people in the field of forest ecology. The scholarship reflects our long-standing relationship with Landcare



Tahae Doherty, Doris Rurehe and Brenda Tahī of the Tūhoe Tuawhenua Trust in planning with Rob Allen and Peter Millard of Landcare Research at Ruatāhuna, December 2012.



Research and our focus on forest ecology as a key area for us to develop skills and a profound understanding. The scholarship is for those who are seeking to study, learn about and/or train in aspects of forest ecology which includes a wide range of fields such as forest biodiversity, conservation, traditional ecological knowledge and indigenous forestry. The scholarship is not necessarily for study for a qualification at a tertiary institution, as it can also be awarded for on-the-job training or short courses. Each year up to \$3000 will be awarded for the scholarship, and more than one person may be awarded the scholarship in any one year.

In December, Nicole Bancroft was awarded the inaugural Manaaki Whenua Scholarship. Nicole Bancroft (Ngati Tawhaki and Te Urewera) is the daughter of Bruce Bancroft and Hohi Te Kurapa, and mokopuna of Kararaina Rangiahua and Hikawera Te Kurapa. Nicole has completed her first year of studying for a Diploma in Environmental Management at the Bay of Plenty Polytech.



The Manaaki Whenua Scholarship for 2012 was presented to Nicole Bancroft (centre) by Richard Gordon Chief Executive, Landcare Research (on the right) and Tahae Doherty, Chair of Tūhoe Tuawhenua Trust (on the left) at a celebration of the award held at Papueru Marae, Ruatāhuna.



Nicole with all the whānau and the delegation from Landcare Research at the celebration for her award, in front of her tipuna whare Te Whātu o Te Kanohi.

In her third year, Nicole is aiming to finish off her studies at Waikato University to gain a Bachelor of Science with a major in Biological Sciences. Nicole's ultimate goal is "to return to Te Urewera and apply all my skills in everything I have learnt to help restore and maintain the land, even enhance its magnificence".

WHO'S INVOLVED:

- Jim Tahae Doherty (Chair), Ngapūtahi
- Brenda Tahi (Executive Trustee), Ruatāhuna
- Rob Allen, Manaaki Whenua

Honey

OPERATIONS

In the last year, we have been focused on our honey business on building productive capacity – clearly without more hives and bees you can't make more honey. The honey operation started the season with 100 hives, and these were used during the season for producing honey during the summer and for making increase on our hive numbers in the autumn. We ended the 2012-13 year with 300 hives and appreciate the contribution we received from Poutama Trust and Watson & Son towards this hive increase programme. The work programme involved making up hundreds of boxes and frames for the new hives. Some of our offcuts from the timber operation is used in hives, so our beekeepers are now becoming accomplished woodworkers!

The big job for the bees in this season was to draw out the comb on the new frames before they can pack in the honey. The hives did well with the hot summer season and some of the trees in the bush flowering really well. Right from the late winter through spring and summer we have had a series of great flowering – parapara then ramarama, hinau and tarata, then kouka and rata. The tawari and tawhero did not fire much this year but the mahoe apparently went all season. In the later part of the season we had kokomuka, houhi and hohoeka. The season produced a crop of mahoe honey as well as stocks of feed honey for the hive increase programme.

We trained a number of people in honey extraction completing a manual exercise at Ruatāhuna, for the crop for local consumption. Darrell Svenson and Huhana Taoho were also trained in honey extraction by Neil Quaife at his extraction plant at Waiheke Honey in Rotorua.

Nick Mitai led our beekeeper team of two for the season, with Te Uamairangi Rangihau starting as assistant beekeeper. Our beekeeper team has built the honey operation through this season with some hard work and with some experimenting on a number of aspects on the beekeeping side. Through all of this,

the team has hugely extended their knowledge and experience.

Our beekeeper team was guided at different points through the season by Norm and Mary Dean of Tauranga, as expert advisors. We have also reached out to other beekeepers and businesses in the industry establishing a key network to help us in our future endeavours. We thank the Deans, and others in the industry who generously give their time and knowledge to help our fledgling honey operation. Their contribution is invaluable to us all as it sets the foundation for the future of the Tuawhenua honey business in Ruatāhuna.



Norm & Mary Dean, advisors to the Tuawhenua honey operation, share their expertise with beekeepers Nick and Te Uamairangi at the Whakariwaka apiary.



Te Uamairangi preparing the smoker - when you blow it onto the bees it calms them down when you're checking your hives.





This is the Maanateepaa Apiary.



Nick & Te Umairangi making the hiveware - boxes every where!



Norm Dean along with the guys checking to see if the queen bee is doing her job



Darrell getting the honey boxes off the hives, ready for extraction



The morning crew having a break after their early start - Te Wakaunua, Huhana & Darrell



Waitangi scraping the capping off the frames so that they can spin out the honey. Maro closely observing, supervised by Huhana

MAHOE HONEY

Pollen testing of our honey by Dr Janet Wilmshurst of Landcare Research reveals that the mahoe flower is consistently preferred for visitation by our bees, as follows:

Year of Season End	Mahoe Pollen ¹ %	Dominant Species ² %	Dominant Species
2011	8.3%	21.5%	Rata
2012	37.6%	37.6%	Mahoe
2013	39.0%	39.0%	Mahoe

¹ The percentage of the total pollen count that is mahoe pollen

² The percentage of the total pollen count that is the species with the highest count for that year's sample

Mahoe is commonly found as a shrub or small tree in our region in gullies and streamside areas. It is also known as 'whitey-wood' from its pale bark and branches often being covered in white lichen. Traditionally the mahoe tree had a number of uses. A slab of soft mahoe was one of the best woods for scraping with a pointed stick of harder wood such as kaikōmako in the friction method for making fire by our ancestors. The wood is slow burning and smouldering sticks of it were carried in stone container to transport 'fire'. The mahoe also had medicinal uses with the bark being used for a pack on burns and the leaves for bathing areas affected by rheumatism, and for application to wounds and skin diseases. The black juice of the mahoe fruit was also used as the colorant for traditional ta moko.



Mahoe is related to the violet family of plants, hence the stunning purple colour highlighted in the flower. It is this deep colour in the berry that was also used in ta moko of old.

MARKETING OUR HONEY

We have been inspired by the stunning colours and properties of the mahoe flower in developing a brand and label for our honey. Our mahoe honey is close to ready for market, which is an exciting milestone for us in the development of our honey business. In this last year, we have investigated opportunities for our honey to be sold in bulk or bottled and branded into domestic and export markets. See our website www.manawahoney.co.nz for more information.

RESEARCH AREAS RELEVANT TO OUR HONEY BUSINESS


During the last year, we have been pondering a number of questions that have or we hope will become the focus for researchers in different fields. We followed up our interest in pollens and nectars in our forest by attending the "Tree for Bees" Conference held in April 2013. This conference covered a range of speakers and topics but had been inspired by the work of Dr Linda Newstrom-Lloyd, a Research Associate of Landcare Research, whose work is focused on identifying high-protein pollen that can nourish bees especially in times of pollen shortage and in critical stages of hive build-up or maintenance of hive health. Further information on the results of Linda's research and the proceedings of the conference are available on www.treesforbeesnz.org.

We are particularly interested in this research identifying good pollen sources for our bees in the forests of the Tuawhenua, and to this end we are first preparing a 'calendar' of pollen collection and availability for our region. Later we will learn how to collect pollen for analysis of its nutritional content, and aim to contribute to Linda's research of pollen sources from our indigenous flora.

Other areas of research that are of interest to us relate to wasps, birds and native bees:

- In recent summers we have noted the prevalence of wasps throughout our forests. Wasps are certainly a real threat to our bees when they start robbing out our honey bee hives. But we are particularly concerned about the impact that these wasps have on other insect life critical to the ecosystems of our region.
- We are also thinking that wasps may be competition at nectar sources for our forest birds and our bees





during the 'honey flow'. Is there any competition between birds, bees and wasps over nectar sources and what are the relative impacts of these species in our forests?

- We have noted that our honey bees largely pass by mānuka and kanuka flowers in our region in preference for other species, leaving the native bee to pollinate and to gather the nectar from these flowers. We are not sure if this reflects honey bee preferences or whether the honey bees have been repelled by the native bees.
- We have also observed that since varroa wiped out feral hives of honey bees throughout our forests, flowering and fruiting of our native trees has been variable. We sometimes link this variability to warming in our climate but wonder if it relates to the decline of birds and the extermination of honey bees in forests as pollinators for our trees. One of the

drivers for our honey business was its contribution to sustaining our indigenous forests through the pollinator role of the honey bee. But we are really interested in how far this role goes and what difference we are making through our honey bees.

Research in these areas will help not only to manage our honey business to success, but also to manage our forests sustainably for the benefit of future generations.

WHO'S INVOLVED

Beekeepers: Nick Mitai, Te Uamairangi Rangihau
Markets & Support: Wenarata Morehu, Kerewai Morunga, Brenda Tah
Research: Linda Newstrom-Lloyd
For more information:
www.tuawhenua.biz
brenda@tuawhenua.biz

Indigenous Timber

OPERATIONS IN 2012-13

The Trust focused on the production of timber from dead and down rimu and other podocarps in 2012-13. We used heli-lifting for recovery as this is the method that has least impact on the bush, and makes some difficult areas accessible. Operations of finding, logging, heli-lifting and milling were established. The field team were trained in a range of skills for the timber operations and had to work their way a raft of operational issues. Producing indigenous timbers from our forest is a challenge and we are still learning about how to refine our operation. Our operation starts with finding the dead and down in our ngahere through to milling, grading and selling of our timber.

Finding our dead and down podocarps (rimu, mataī, miro, kahikatea and totara) involved a trip by helicopter to identify patterns in the bush and to locate the standing dead, then ground searches to pinpoint location. Standing dead trees were carefully checked for greenery as only completely dead or down trees were logged for this operation.

Logging is a crucial stage requiring special skill and hard work. A sawfish is used to cut the logs in ways to keep good log length whilst also being an optimal weight for heli-lifting. The heli-lifting stage of the operation is challenging, and success depends on team-work, clear communication and good safety procedures. By the end of our operation our team got their turnarounds to be as quick as the best in the country.

Measurements, mapping and data management form a key part of the operation. We need to do this for managing the overall operation as well as to comply with requirements under the Forests Act. Trees and logs are measured for the calculation of volumes; locations are recorded by GPS. All data are managed in databases and in mapping systems by the trust office.

Markets for indigenous timber were researched and relationships with a number of buyers established. We used a swing-blade Peterson sawmill to mill our timber to different specifications depending on the requirements of our buyers. Our milling team was



trained in grading standards and continue to refine their skills in this area.

Overall the focus for the development of this business is still developing as we move to test operational approaches and market potential. Producing timber from the Tuawhenua forests is a challenging business, and we are working hard to make it a viable proposition. We aim to learn from every experience so we can build

a solid foundation for the future. We believe timber from our ngahere is precious - not just because it has come from Te Waonui a Tane but also because we put so much into it from us here in the Tuawhenua—Te Manawa o Te Ika.

For more information:
www.tuawhenua.biz
brenda@tuawhenua.biz



Elvis Miki, Stogie Ahuriri, Roy Edwards and Raymond Te Kurapa— the logging crew work as a team to process logs in the bush, ready for recovery.



Logs, after the sawfish has ripped through them. These will be stropped ready for the heli-lift operation.



Puke Timoti, resourceful as our logging team is, uses a car jack to split open a huge log.



Nick Mitai known for his wood work skills for hives in the beekeeping operation has here also used Tuawhenua timber (tawa in this case) for the wash bench in his bathroom. We are encouraging the use of our timbers locally for a range of applications





The Forest Resource

We are committed to sustainable management of our forests. Thus our harvest planning involves the recovery of very low log volumes. Overall the parameters for our indigenous forestry operation are set by a Sustainable Forestry Management Plan (SFMP) approved and issued by the Ministry of Primary Industries under the Forests Act.

The Trust worked closely with the Ministry of Primary Industries during last summer to revise our proposed SFMP which reduced the level of potential level of harvest of all species, particularly podocarps such as rimu and mataī. We now have greater confidence now in the sustainability of our proposed harvests for the indigenous timber business. However, we will continue to collect data on the forest resource and review the SFMP should future data suggest changes in harvest levels. Meanwhile, the Trust maintains a policy of under-harvesting well below allowable levels so we can be certain that our forest resource is being managed sustainably over time.

RESEARCH ON OUR FOREST RESOURCE AND TIMBER MARKETS

In 2012, we successfully completed a three-year research and feasibility project on podocarp restoration and tawa harvesting (Sustainable Farming Fund Project 08/060). We have reported on this work in previous issues of Te Kaahu and the project report is available at <http://tuawhenua.biz/PodocarpRestorationReportTe%20Tuawhenua.2012.pdf>

The project involved:

- A coupe harvesting trial in tawa forest to generate canopy openings for light-demanding podocarps. Monitoring of coupe impacts will inform future harvests. Through this trial we devised a coupe harvest approach that is being applied under our SFMP to integrate the harvesting of tawa which are the predominant species in our forests with the restoration of podocarps which we have found to be not regenerating successfully.
- Transplanting out 5000 podocarp seedlings and

releasing 1250 seedlings or poles from competition to test methods and success rates on different sites.

- Testing of the feasibility of tawa harvest methods and potential market opportunities.

The project answered some of our questions on coupe harvesting and podocarp restoration at the time but opened a whole raft of new questions that we need to research to ensure viability of our forest management from both economic and environmental perspectives.


TREE GROWTH RATES

Firstly, we know that timber production from indigenous forests can only be sustainable if it is based on sound and relevant estimates of tree growth rates. However, the tree growth rates available for use in our SFMP were taken from other parts of New Zealand and may not be accurate for our forests. Previous work by Landcare Research Manaaki Whenua has shown that within the central North Island, tawa growth rates can vary three-fold among sites while rimu growth rates can vary more than five-fold (based on a report by Mark Smale and others from Manaaki Whenua). While the volcanic plateau has a long history of forestry production research, steepland forests such as ours in the Tuawhenua have been neglected and growth rates are poorly known.

The problem is of central significance to our planned forestry operation. It is essential to know growth rates in order to accurately estimate the available harvest. If we underestimate growth rates, we will make poor returns and our operation could fail. If we overestimate growth rates, we will overharvest, rapidly deplete our natural capital and exhaust the economic prospects from our forests.

In collaboration with Manaaki Whenua, we are about to undertake a research project that will measure tree growth rates in relation to local competition and environment, and calculate more accurate volume growth models. The production estimates created during this project also will be useful for others including Maori organisations with similar steepland forests.





This project will be undertaken with support from the Sustainable Farming Fund for Maori Agribusiness in 2013-15.

TAWA RESOURCE AND MARKETS

We found through our initial feasibility study that the economic viability of the harvest of tawa is limited by the demand for tawa which has been decreasing over a number of years. As a result, tawa forests throughout the country including ours stand as untapped sources of production. Our initial investigation has found that MPI consents for 2011-2012 show that whilst 3000 m3 of tawa per annum and another 16,369 m3 in total is available for harvest, only 139.9 m3 was actually harvested. That is the annual tawa harvest was less than 1% of the volume permitted or planned for harvest.

Tawa was once appreciated as a timber and forest product for a number of uses such as furniture and flooring, but demand now for tawa is weak. We have found in our preliminary investigations that the decreasing demand stems mainly from tawa becoming hard-to-get once large scale podocarp harvest ceased, which in turn has resulted in users turning to imported hardwood substitutes such as American oak or eucalypts. Tawa also suffers from negative perceptions in the timber market as it needs expert and timely treatment in milling and drying to avoid defect. These issues have had a spiralling effect so that the annual national harvest of tawa has dropped to negligible levels.

Our preliminary investigations also find that the tawa market is sitting as latent potential and could be stimulated through this project to broaden and deepen demand. Tawa is still known and preferred by a few old hands in the industry if they can get it; tawa has some special features as a hard wood that makes it attractive for particular uses; and tawa is a 'blond' timber – the right colour for a developing global trend towards lighter coloured timbers. Options for other hardwoods such as manufactured flooring for domestic and export markets present potentially as options for tawa too.

For tawa forest owners, many of whom are Maori, realising or enhancing the value of their tawa resource through lifting market demand is the key to the overall

economic viability of sustainable management of their forest. In many tawa-podocarp forests, the podocarp resource has been largely logged so that tawa has become a predominant proportion of the value of the forest resource. In our forest as an example, the allowable annual harvest of tawa is 10 times the volume allowed for podocarp. Thus the economic viability of tawa harvest is pivotal to bringing these forests into production.

We have initiated a project working with Landcare Research and others within the timber industry to examine the tawa resource across the country and to investigate the value proposition of tawa in products and markets in domestic and export terms and identify opportunities for product and market development for tawa. It will engage expert and key players from the community of interest for the project in a strategy development process to identify ways to increase value and demand for tawa as a forest product. Outcomes sought for this project are the uptake of these strategies by agencies, forest owners and players along the value chain, which in turn will increase demand for and harvest volumes of tawa. Expanding economic viability of tawa harvest in this way will, in the long run, increase the contribution of indigenous forestry to GDP and the revitalisation of communities near tawa forests, many of which are predominantly Maori. This project will also be undertaken with the support of the Sustainable Farming Fund for Maori Agribusiness of the Ministry of Primary Industries.

WHO'S INVOLVED

Field Team: Hekenoa Te Kurapa, Puke Timoti, Raymond Te Kurapa, Roy Edwards, Elvis Miki, Johnson Ahuriri, Timi Rawiri Tahī, Marc Symes

Markets and Support: Wenarata Morehu, Brenda Tahī

Research: Mark Smale, Sarah Richardson, Fiona Carswell

For more information:

www.tuawhenua.biz

brenda@tuawhenua.biz

SmaleM@LandcareResearch.co.nz





Why have Landcare been building fences in the forest?

BACKGROUND

Over the last decade we have been trying to determine whether there are enough seedlings in Tuawhenua forests to replace the adult trees that are there now. We have surveyed several large areas of forest to work out the number of seedlings in a hectare, and based on these estimates of seedling density, and measurements of seedling growth and survival rates, we believe the forests are understocked to replace the adult trees that are there now. One explanation for low seedling densities is animal browsing. Cows and horses use many of the forests around Ruatāhuna, and along with wild deer and pigs, these animals are probably eating a large number of seedlings. What we don't know is whether this browsing is too much for the seedlings or not. We set out to explore how many seedlings these animals eat, and whether we could make seedlings grow faster and survive longer by fencing out animals. We did this in two types of forest: mature forest around Ruatāhuna where it's dark in the understorey, and kānuka forest near Tawhiwhi where there's plenty of light for seedlings to grow fast.

BUILDING FENCES AT TE HUIA, MANGAPAE, TARAPOUNAMU AND TAWHIWHI

Taawi Te Kurapa organised a group from Ruatāhuna to build fences around ten small patches of forest at Te Huia, up the Mangapae and up on Tarapounamu. These patches were chosen from a total of twenty patches that we have been monitoring for the last few years. We have been tagging tree seedlings and measuring their heights and whether they were healthy. We tagged six species of tree: tawa, rimu, kahika, toromiro, mataī and tawhero to find out how fast the different species grew and if each species had a unique response to keeping out the browsing animals.

The fences went up in 2010 and this autumn, we measured the seedlings inside and outside to see if there had been any effect of keeping the animals out. We found that fencing made no difference to growth of tawa, rimu and kahika seedlings, but toromiro, mataī and tawhero grew faster without animals. The

differences were quite small though – just a few centimetres more growth each year inside the fences. Importantly, the effect of fencing was highly variable: some fences had a big effect, while others made little difference. We also noticed that some of the smaller plant species such as toropapa (or matuka-roimata) are becoming more common inside the fences.

FENCES IN YOUNG KĀNUKA FOREST AT TAWHIWHI

Our second group of fences went into kānuka forest down the Whakatāne River near Tawhiwhi Hut. Tom Te Ata from Ohaua has been maintaining these fences and keeping an eye on the seedlings for us. We tagged many different species at Tawhiwhi including the podocarps, rewarewa, hinau, tawhero and tawa. These kānuka forests are strikingly different from the mature forests around Ruatāhuna as they are shorter, more open and much more light in the understorey. Seedlings grew much faster at Tawhiwhi than around Ruatāhuna and the effect of fencing was much greater – most species grew much faster without animals. New seedlings have germinated inside the fences, while this hasn't happened outside. Overall, the animals are having a much larger effect on seedlings at Tawhiwhi in the young kānuka forest, than they are around Ruatāhuna in mature forest.

WHAT DOES IT MEAN FOR THE TRUST?

The fences around Ruatāhuna are all in mature forest with tall podocarps, large tawa and old tawhero trees. It's quite dark in the understorey and seedlings typically grow slowly. Most of the seedlings in these mature forests won't become large trees because it's too dark to grow, and there isn't room in the canopy for them to form a tree. However, even mature forests need seedlings so that when a canopy gap opens up, there are young trees there ready to fill them. We think that animal browsing is something to watch in the mature forests around Ruatāhuna – it certainly affects some species, but the presence of large trees “buys some time” for planning how to increase podocarp seedlings and saplings over the next few years.



The fences at Tawhiwhi are in young kānuka forest with some rewarewa. These forests grew up after a fire over a hundred years ago. They are still in the process of returning to tall podocarp forest and the lack of seedlings here, and their very slow growth outside exclosures is a real worry. We think that animals are preventing these kānuka forests from returning to tall forest. Future seedling plantings could be targeted at kānuka stands but these will need to be fenced, even temporarily to keep out cows, to allow seedlings to grow tall enough to resist grazing.

WHO'S INVOLVED FROM THE TŪHOETUAWHENUA TRUST:

Brenda Tahi, Puke Timoti, Taawi Te Kurapa, Tom Ata

WHO'S INVOLVED FROM MANAAKI WHENUA:

Sarah Richardson, Chris Morse, Robert Holdaway, Fiona Carswell



Puke Timoti measuring a seedling outside a fence at Te Huia.



Taawi, Chris and Raymond building a fence at te Huia.



Fiona measuring a toromiro seedling at Te Huia.



Kev Drew from Manaaki Whenua with one of the fenced plots at Tawhiwhi.



Big birds with big appetites

Since the early days scientists have wondered about what moas might have eaten. But why should we care? Being so recently extinct, moa ecology is still intertwined with New Zealand's present day vegetation. We can see evidence of moa herbivory in the growth habits of many native plants, and many of the oldest trees in our forests today probably once had their branches munched on by moas.



Different growth forms of lancewood (*Pseudopanax crassifolius*): left, juvenile; right, adult. The spiky young leaves are thought to have evolved as a defence against moa.

But how do you study the diets of birds that have been extinct for hundreds of years? The answer: by looking at the dung they left behind!

Since we began studying moa diets about 7 years ago, we have uncovered more than 2000 moa dung (called 'coprolites') from about a dozen caves and rock overhangs. However, finding moa coprolites takes a lot of experience, and we can now recognise whether a cave has the right conditions (rock type, temperature, humidity etc.) to preserve them. We also take care to avoid sites likely to contain archaeological layers.

Once we find the coprolites, we extract many different types of information from them. We extract DNA from the coprolites to tell us which of the 9 different moa species deposited the coprolites, and also which plant species it was eating. We get further information on the diet by looking at seeds and pollen preserved in the coprolite. We have also used DNA from coprolites to identify the types of parasitic worms that lived in the digestive tracts of moa!

Our work on moa coprolites has already changed people's idea of moa as only having fed on trees and shrubs. While they certainly did to some extent, they also grazed on low-growing shrubs and small herbs. We have also shown that some moa had seasonal differences in habitat use, feeding in grasslands during warmer months, and sheltering in forests during winter.

But so far all our moa coprolites have been from the South Island. We are interested in finding some from the North Island. Some of New Zealand's largest

fruits, such as those from tawa and taraire only occur in the North Island, and we are interested to see whether moa once ate these.

In May we visited Te Urewera and were guided around a couple of different sites by local Tūhoe. Some of the caves we saw, especially around the Waikaremoana area, looked very promising. One cave in particular was dry enough that a possum had become naturally mummified in there! We hope to return sometime in the future to explore more sites in the area.





Moa coprolite (approximately 12 cm long)



Checking out a rock overhang near Waikaremoana for its potential to preserve moa coprolites



Finding mummified animals like this possum is a good indicator of a dry cave, and therefore potential for moa coprolites to be preserved in there

WHO'S INVOLVED FROM THE TŪHOE TUAWHENUA TRUST: Brenda Tahī

WHO'S INVOLVED FROM MANAAKI WHENUA:

Jamie Wood (WoodJ@LandcareResearch.co.nz)
 Janet Wilmshurst
 (WilmshurstJ@LandcareResearch.co.nz)
<http://www.landcareresearch.co.nz/science/plants-animals-fungi/ecosystems/prehistoric-settlement/megaherbivores>

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Editors:	Fiona Carswell Sarah Richardson	Published by:	Manaaki Whenua Landcare Research PO Box 69040 Lincoln 7640 New Zealand	Telephone:	+64 3 321 9999
Layout:	Cissy Pan			Facsimile:	+64 3 321 9998
Thanks to:	Christine Bezar				www.landcareresearch.co.nz

