

Mahinga Hipi Farms

Biodiversity Management Plan



Please note: This farm plan has had farm, family and place names anonymised by the pilot team for the purpose of the pilot, but other than that this is an example of a biodiversity management plan prepared for a working farm.

Contents

Mahinga Hipi Farms - Introduction.....	3
Biodiversity vision statement.....	3
Stocktake of Biodiversity assets.....	4
Mahinga Kai Values.....	5
Assessment of Biodiversity Assets.....	6
Asset 1: Main bush block.....	7
Asset 2: Wetlands:.....	8
Asset 3: Assortment of native flora and fauna across the farm:.....	10
Risks to Biodiversity.....	11
Biodiversity Objectives and Action Plan.....	12
Goal 1: Stock exclusion of the Wai River.....	12
Goal 2: Enhancement of main bush block.....	12
Goal 3: Protection of remnants.....	13
Goal 4: Stock of exclusion of wetland.....	14
Goal 5: Blackberry control in the fenced wetland.....	15
Goal 6: Investigate the presence of native species.....	15
Goal 7: Establish biodiversity monitoring.....	15
Goal 8: Review of Biodiversity Management Plan.....	16
Goal 9: Install additional water tanks, a reticulated water system and troughs.....	17
5-Year Operational Biodiversity Action Plan.....	18
Appendix 1 Biodiversity Monitoring.....	21
Automated Acoustic Bird Monitoring.....	21
Photo point Monitoring.....	21
Freshwater Monitoring:.....	22
Appendix 2: List of Plants Found at Mahinga Hipi Farms.....	24

Mahinga Hipi Farms - Introduction

Mahinga Hipi Farms is owned by Richard and Rachel Williams and was purchased by the Williams family in 1993 with the assistance of Rachel's family. The home farm is 360 ha (260 ha effective) of rolling to steep hill country. A further 540 ha (400 ha effective) of leased land has been added to the farm over time, for a total of 900 ha. The farm is managed for sheep and beef production with all feed produced on farm. All livestock are bred on the farm and as many as possible are finished each year. Across the hilly landscape, there are 240 ha of indigenous vegetation carrying a large range of native fauna and flora. The farm falls within the Ruapehu District, the Manawatū-Whanganui Region, and the Ngāti Tūwharetoa takiwā (district).



Biodiversity vision statement

“We want all aspects of native biodiversity to increase across our farm. Ideally, we want our farm to be predator-free and our bush to be filled with birds, reptiles, and bats. We have started to fence off our major waterways and will continue to do so to promote healthy waterways filled with native aquatic life. Our partnership with our lessors is important and we will continue to work with them to improve native biodiversity in the wider landscape beyond the home farm.”-Richard and Rachel Williams

Stocktake of Biodiversity assets

Indigenous Vegetation

Before human settlement

The land which is now the Mahinga Hipi Farms, would have been covered with indigenous podocarp-broadleaved forest with a diverse canopy of angiosperm trees. Tawa and kāmahī would have been abundant in the canopy with occasional emergent rimu, miro, kahikatea,

mataī, and northern rātā. Historic records noted that the area had one of the highest tōtara densities in New Zealand. There would have also been the occasional mangeao, hīnau and rewarewa scattered throughout the forest, and locally pukatea would have been common in the canopy within gullies.

Present

These days there is 240 ha of continuous indigenous forest and regenerating indigenous shrubland on Mahinga Hipi Farms. During the 1920s, forests around the farm were harvested and logs were removed with the use of steam locomotives. Abandoned machinery and wire can still be found in the forest and on the home farm.



[rewarewa](#)



[rimu](#)

Exotic Vegetation

Currently, there is only 0.5 Ha of exotic forest on the home farm. There was a larger woodlot on the farm, but this was harvested 20+ years ago and was converted into pasture.

Native fauna

Native birds that are found on the property include tūī, pūtangitangi/paradise shelduck, riroriro/grey warbler, tauhou/silvereye, pīwakawaka/fantail, with the occasional kārearea/falcon, kākā, and miromiro/tomtit. Over the last 30 years, with vigorous possum control, the kererū population has increased year after year. Whio occasionally nest on the edge of the Wai River.

Tuna/eels are known to be in the Wai River and other waterways on the property, but it is believed their populations are declining. Mayflies and Caddisflies are commonly found in the Wai River. Historically, freshwater crayfish/kōura have been observed in the Wai River but their population is believed to be decreasing. Their absence were noted during a 2022 eDNA test, but they may still be present in relatively low numbers that were not detected during the testing period. During a visit from the Department of Conservation, comments were raised about the abundance of lizards across the farm, although no specific species were named. They also suspected it was possible that kiwi could also be present, although none have been seen or heard over the past 30 years while Richard and Rachel have been on the farm.



[Grey warbler | Riroriro](#)



[Silveryeye | Tauhou](#)



[Tomtit | Miromiro](#)

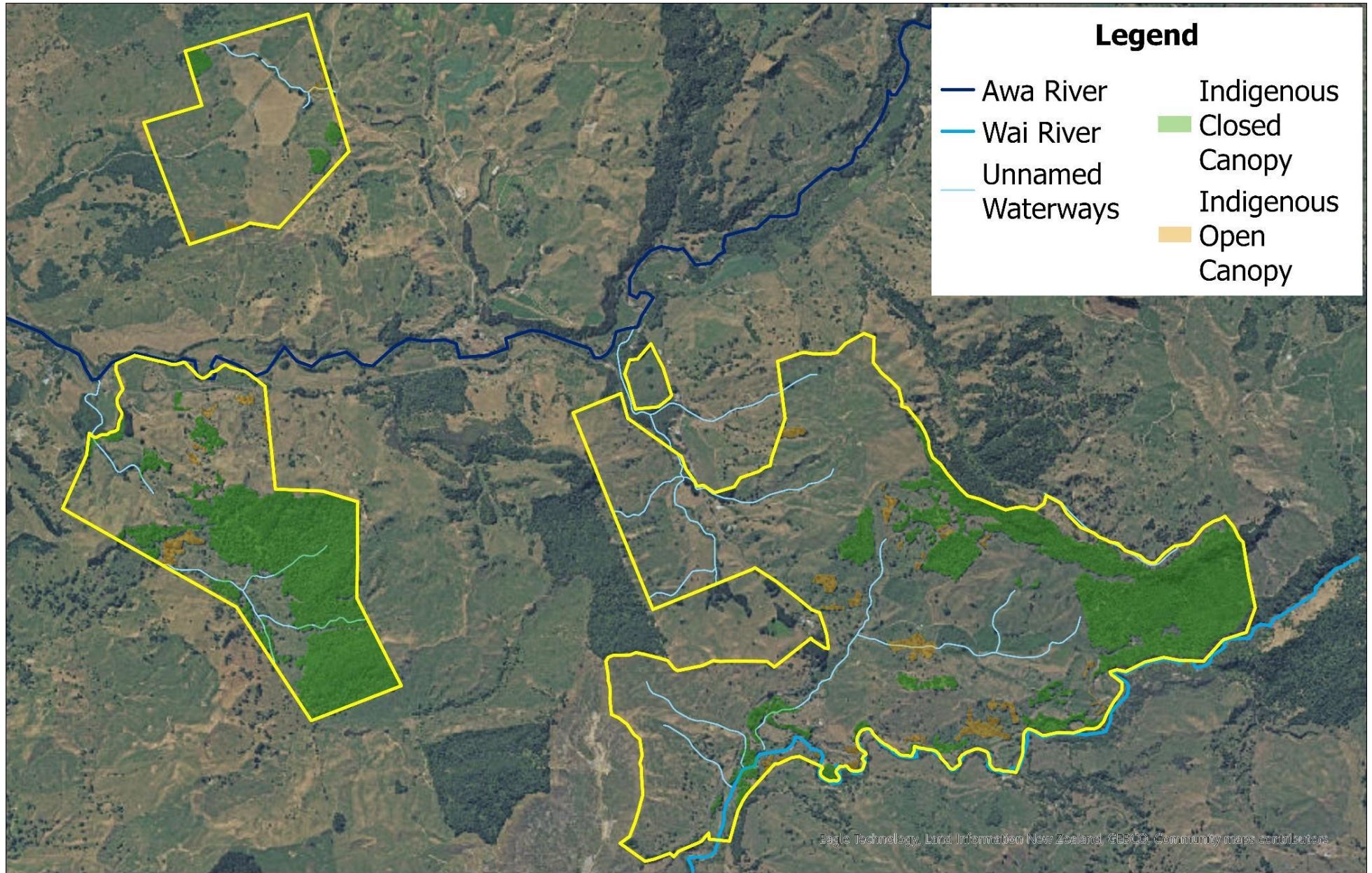
Mahinga Kai Values

Mahinga kai is about the value of natural resources – our birds, plants, fish, and other animals and resources that sustain life, including the life of people. It is a culturally important practice as it connects people with the land, allows for customary traditions to be passed down through generations, and provides a vital food source. These things are the essence of kaitiakitanga, or what many people today call guardianship. Below are just some examples of mahinga kai species that are found on Mahinga Hipi Farms:

- Tī kōuka | Cabbage trees
- Kahikatea
- Harakeke | NZ Flax
- Raupō | Bullrush
- Karamū | Coprosma robusta
- Pūtakitaki | Paradise Duck
- Kāhu | Harrier Hawk
- Kōtare | Kingfisher
- Pūkeko | Swamp Hen
- Tuna | Eels
- Koukoupāra | Upland Bully
- Toitōi | Common Bully

Assessment of Biodiversity Assets

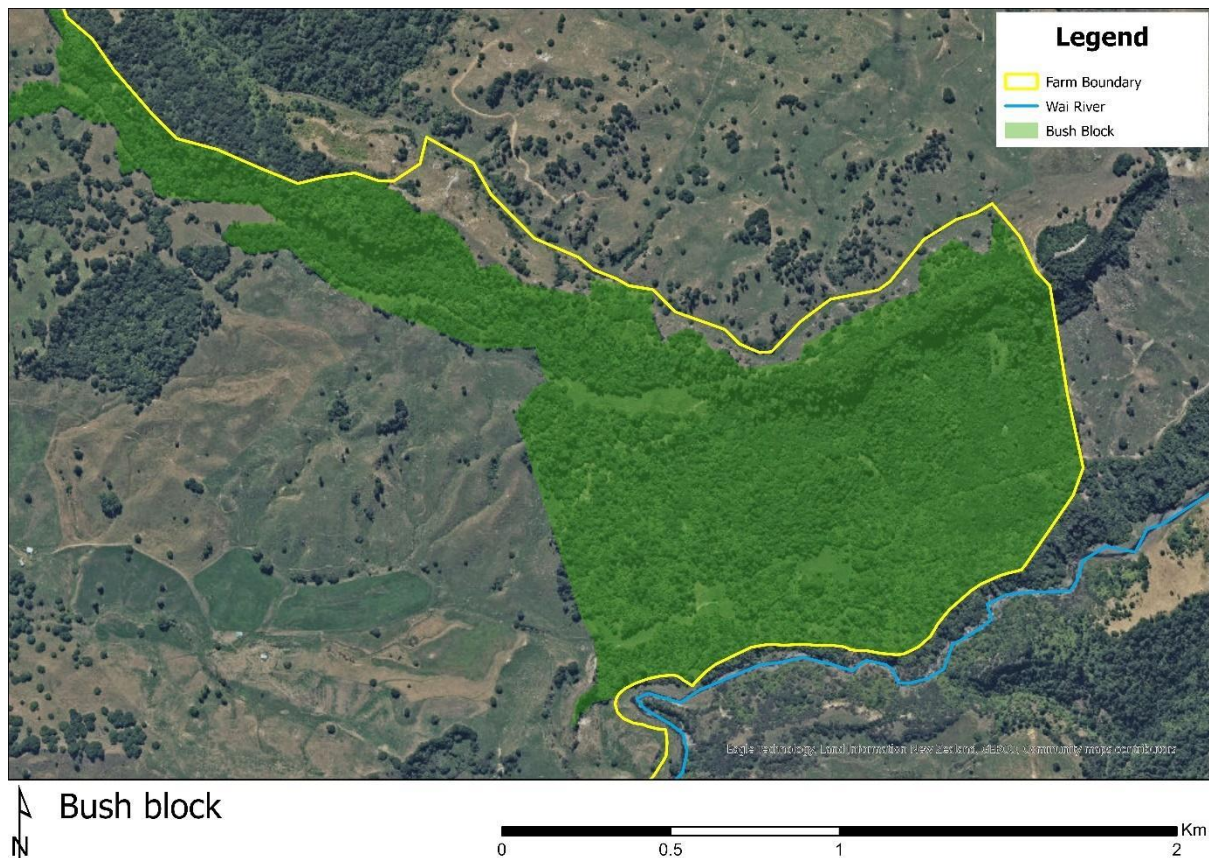
Map showing identified habitat that would support Indigenous terrestrial and Indigenous aquatic biodiversity.



Asset 1: Main bush block

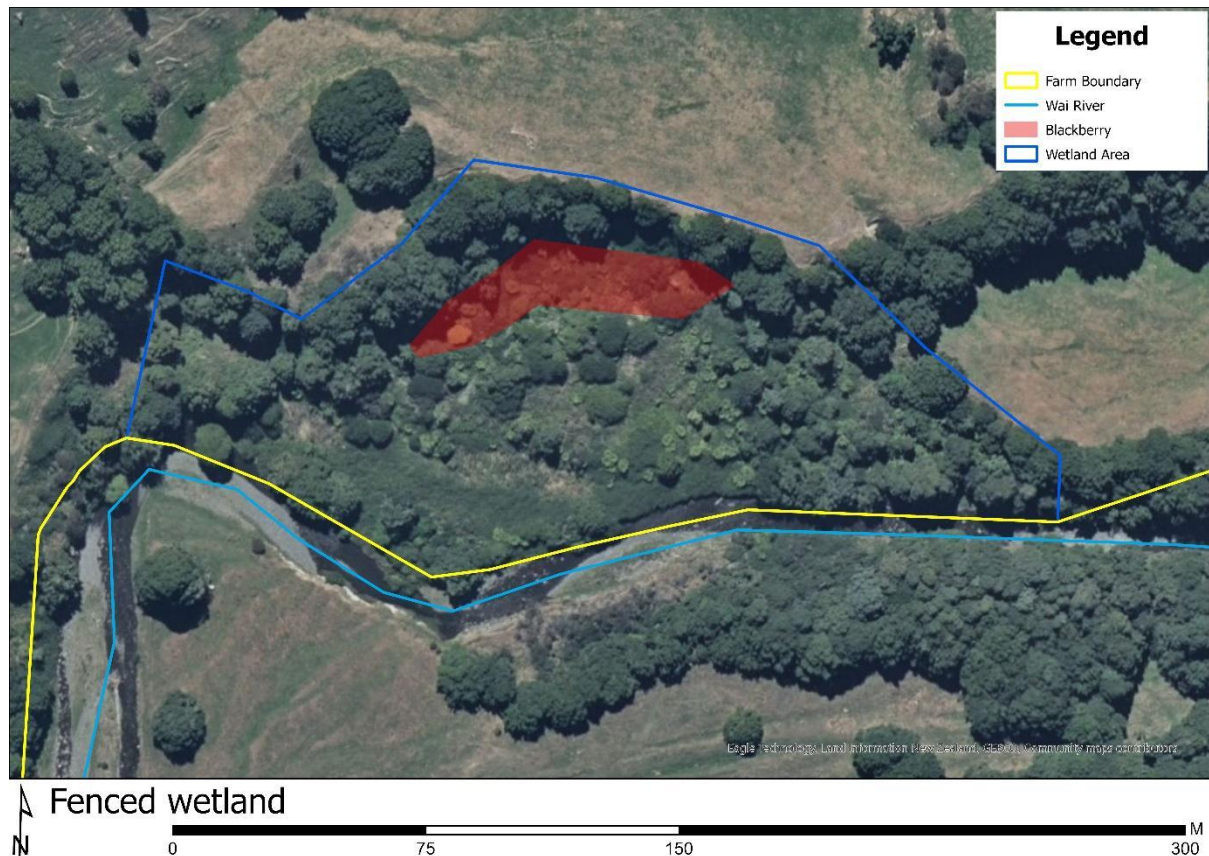
The 81-ha bush block on the home farm is a tawa-kāmahi podocarp forest dominated by tōtara with emergent kahikatea, mataī, miro, and rimu, and the occasional manglea, hīnau and rewarewa. An assortment of bird life can be found in the bush including fantail, bellbird, and silvereye. The occasional kākā and kārearea can be seen, but it is unlikely they reside in the bush block long term. Whio occasionally nest on the edge of the bush block along the Wai River.

Currently, livestock is not excluded from this forest and therefore the understory is being constantly degraded. It is not feasible to exclude stock from the entire bush due to hard rock just below the surface and because it's necessary allow access to the bush for moving stock between paddocks. However, approximately 58 ha will be stock excluded during the lifetime of this plan. Deer and goats will always have access to this bush block via the Wai River. Therefore to reduce their presence within the bush block, they will be culled when possible by family members and staff. A pest exclusion vegetation plot will be installed to assess how much damage larger pest animals are causing to the forest.



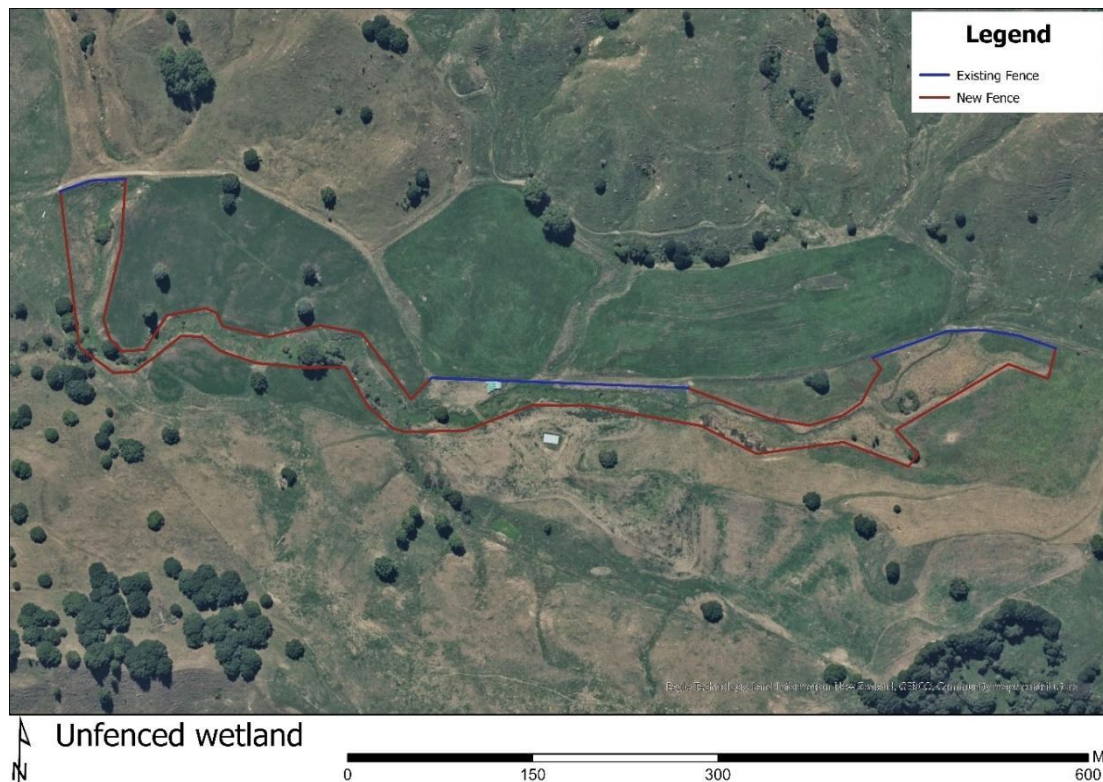
Asset 2: Wetlands:

There are two wetlands on the home block. One has been fenced off for 10 years and makes up a 2 ha area filled with tall raupō, an assortment of ferns, and a couple of pokaka. A blackberry infestation is present with it weaving through the raupō and smothering ferns. If management actions are not implemented, the whole wetland will eventually be covered in blackberry. Fish and eels likely use the wetland for spawning. Further investigation is required to confirm the presents of pūweto/spotless crane. This can be achieved by listening for their calls on summer evenings or placing a game camera amongst the raupō. There was evidence of browse and movement of feral goats and deer through the area.





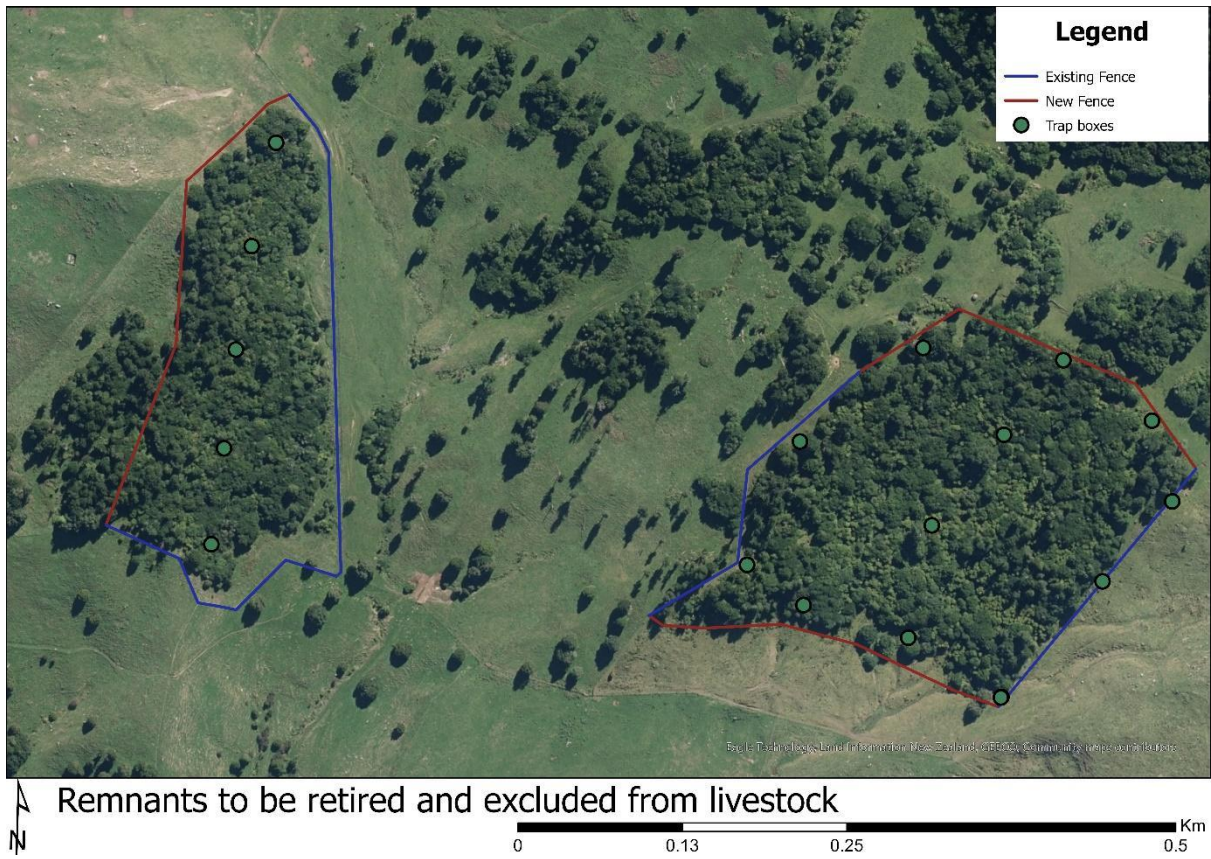
The 3 ha wetland near the deer shed hasn't been fenced off due to the cost, and because at the time it was necessary to graze the area. However, as the farm has grown, this area can now be retired without having a major impact on business. Currently, only raupō and a couple of willows are present in the area. Due to the high number of feral goats and deer across the farm, the area will not be planted. Instead, the area will be left to naturally regenerate but will be lightly grazed by sheep periodically to minimise weed spread. Once deer and goat populations are down to manageable numbers, considerations will be given if active planting is required. A further long-term objective will be linking this wetland to the 0.8 ha wetland area to the north.



Asset 3: Assortment of native flora and fauna across the farm:

Across the farm, there is an assortment of native trees in paddocks. These include rimu, miro, kahikatea, mataī, tōtara, tawa, and kāmahī. These trees provide shade for stock, which is vital as summer temperatures get above 30°C, therefore, restricting stock access to shade will have negative impacts on the animal's welfare.

However, two remnants have been identified to be fenced off. Once fenced, the western remnant will make a 4.5 ha stock excluded patch of bush. The eastern remnant already has some deer fencing around it, and therefore will be fenced to exclude deer, goats, and pigs. Once fenced this will make a 6.8 ha stock and pest exclusion area.



Risks to Biodiversity

The main risks to native biodiversity identified on Mahinga Hipi Farms are from pest animals such as:

- Mammalian herbivores: Feral goats and red deer.
- Mammalian predators: Possums, stoats, ferrets, rats, and cats.



Goats will destroy the forest understory as well as cause mortality in young seedlings by herbivory.



Stoats often catch large numbers of animals and cache them in their burrows.



Deer will destroy the forest understory as well as cause mortality in young seedlings by herbivory and older saplings by rubbing their antlers and stripping the bark.



Possums can strip a tree of foliage within one night. They also predate on bird eggs and young chicks.

Biodiversity Objectives and Action Plan

Goal 1: Stock exclusion of the Wai River

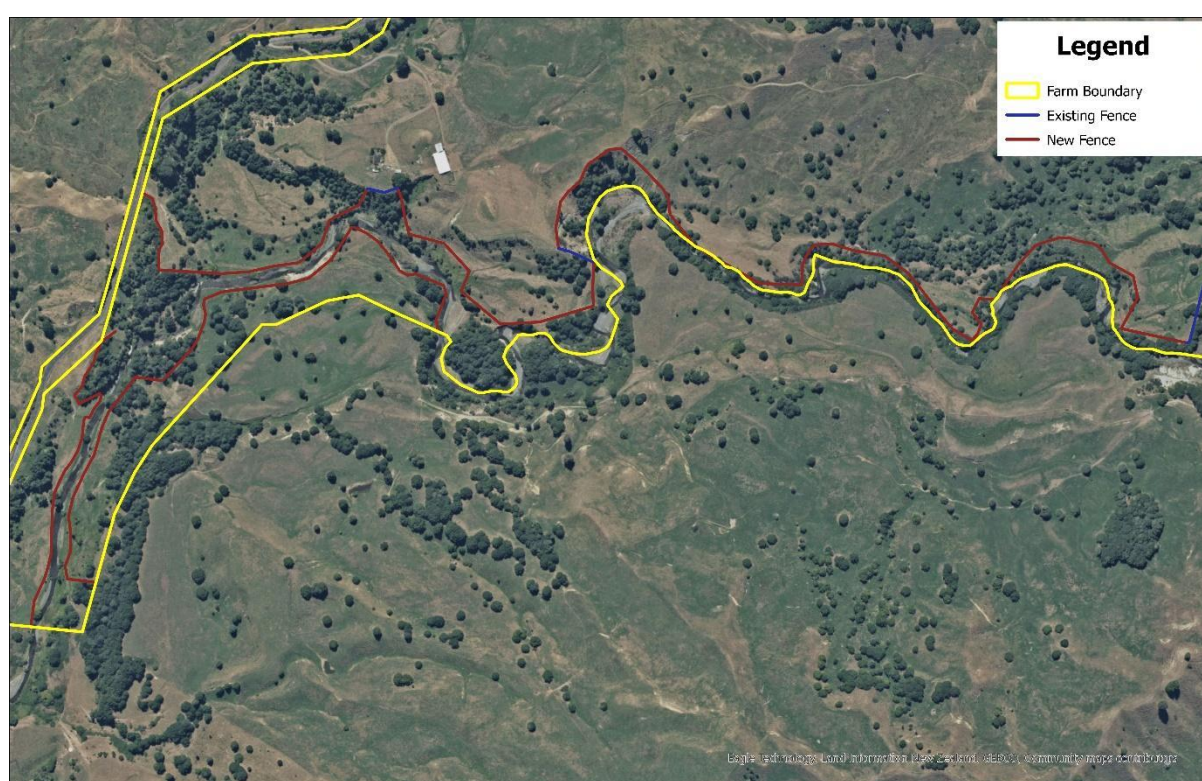
The Wai River has been fenced on the home farm but has not been fenced on the lease blocks. In total ~4200 m of fencing will be required to fully exclude livestock from the Wai River on the lease blocks. Due to the length of fencing required, only 2-wire fencing will be used.

Benefits for Biodiversity

In addition to keeping waterways clear of sediment, nutrients, and pathogens, excluding stock also allows banks to regenerate and provide shelter and safety for stream life.

Effects on Farm Business

Excluding stock from waterways (particularly at calving and lambing) reduces the likelihood of young animals falling into water and drowning.



Stock exclusion from the Wai River on lease blocks

Goal 2: Enhancement of main bush block

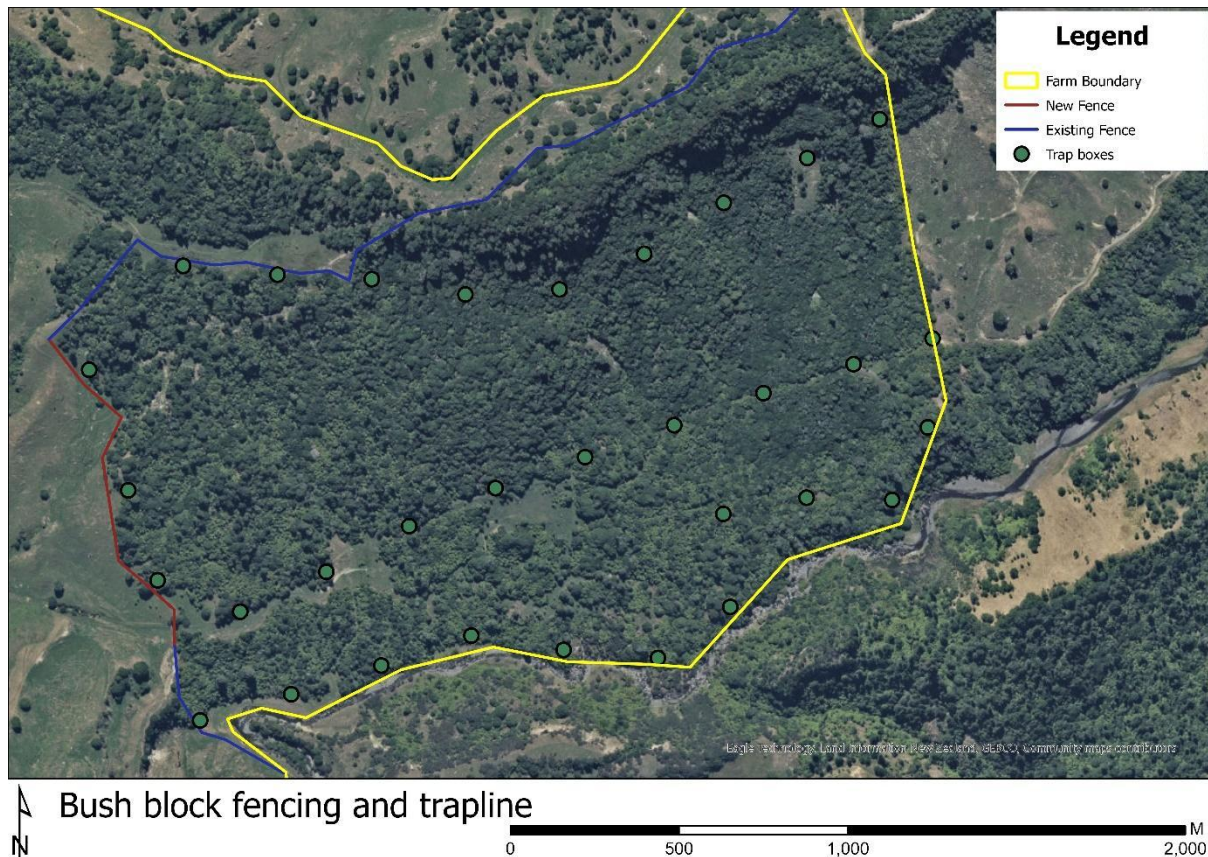
It is not feasible to fence off the entire bush without giving up significant productive land. Further to this, there is solid rock just below the surface surrounding the bush area. Making it difficult to fence around the entirety of the bush block. However, fencing will be installed where appropriate to exclude stock from approximately 58 ha. Unfortunately, deer and goats will still be able to access the bush block via the Wai River but will have their population culled when feasible. The possum population is controlled by the regional council, but a pest control network will also be installed and serviced regally to reduce the total number of rodents and mustelids present. The trapline will utilise the old tramline and stock tacks. There is potential for the trapline to be extended into the neighbouring farm to further increase trapping efforts.

Benefits for Biodiversity

Livestock, goats, and deer can damage trees by grazing foliage, stripping bark, pushing smaller trees over or damaging them through trampling. Mustelids (stoats, weasels, and ferrets) and rodents all predate native bird and lizard fauna and can be extremely damaging to biodiversity.

Effects on Farm Business

Birds and insects provide ecosystem services beneficial to farming such as pollination, seed dispersal, and improved soil health.



Goal 3: Protection of remnants

Two remnants have been identified to be fenced off. Once fenced, the western remnant will make a 4.5 ha stock excluded patch of bush. The eastern remnant already has some deer fencing around it, and therefore will be further fenced to exclude deer and goats. Once fenced this will make a 6.8 ha stock and pest exclusion area. A pest control network will also be installed and serviced regally to reduce the total number of rodents and mustelids present.

Benefits for Biodiversity

Livestock, goats, and deer can damage trees by grazing foliage, stripping bark, pushing smaller trees over or damaging them through trampling. Mustelids (stoats, weasels, and ferrets) and rodents all predate native bird and lizard fauna and can be extremely damaging to biodiversity.

Effects on Farm Business

Birds and insects provide ecosystem services beneficial to farming such as pollination, seed dispersal, and improved soil health.



Benefits for Biodiversity

Effects on Farm Business

Goal 5: Blackberry control in the fenced wetland.

The worst affected areas can be controlled by spraying metsulfuron-methyl 600g/kg (7.5g/15L) or a product containing 100g picloram+300g triclopyr/L (60ml/15L) or triclopyr

600 EC (60ml/15L) in summer-autumn before leaves become brittle. Where blackberry is growing through the natives it will have to be controlled by cutting and painting the stumps with glyphosate (200ml-500ml/L).

Benefits for Biodiversity

Uncontrolled blackberry will smother native vegetation, killing off habitat for native fauna.

Effects on Farm Business

Although blackberry spreads predominately by developing new root systems and sprouting new shoots, birds distribute seeds (at a low germination rate) which can cause an infestation on other parts of the farm.

Goal 6: Investigate the presence of native species.

Kiwi, spotless crane, and bats may be present on the farm, however further investigation is required to confirm their presence.

Spotless crane could potentially be in the fenced-off wetland. Their presence can be confirmed by going to the wetland in the evening and listening for their call. Examples of their calls can be found at <https://nzbirdsonline.org.nz/species/spotless-crane>.

Kiwi may be present in the bush block. A kiwi sniffing dog will be able to confirm their presence. Contact the local Department of Conservation office or the regional/district council to ask if they will be able to assist.

Bats maybe present in the bush block. The use of bat boxes will confirm their presence. Contact the local Department of Conservation office or the regional/district council to ask if they will be able to assist.

Goal 7: Establish biodiversity monitoring.

Establish automated acoustic bird monitoring:

One acoustic bird recorder should be purchased from the Cacophony Project <https://www.2040.co.nz/collections/cacophonometer-bird-monitoring>. This should be placed in the main bush block. It is recommended to put this near the vegetation plot discussed below. The recorder will need to be checked regularly to back up data, this will need to be done every 3-12 months depending on the storage capacity option chosen.

Establish photo point monitoring:

The simplest way to monitor change in your native vegetation (as a proxy for biodiversity generally) over time is to install a photo-point monitoring network. This entails taking photos from the same location, in the same direction at the same time every year. The photos should show an area of land where you expect to see a change in vegetation over time. At Mahinga Hipi Farms, your initial photo points should show a view of areas where management actions such as planting, weed control and stock fencing have already been applied and for future management plans. Further detail on these methods is found in Appendix 1. Suggestions for where to set up photo points are also found in Appendix 1.

Establish vegetation monitoring plot:

As deer and goats are not able to be fully excluded from the main bush, it is important to note the damage they are causing in stock-excluded areas. The simplest way to monitor the

damage pest species are having on vegetation is to set up exclusion plots. Two plots should be set up in the main bush, one where livestock have been excluded and the other where they are not. This can be achieved by wrapping deer fencing around trees to make a 10m x 10m plot. Photo points should also be established to note change in vegetation over time with pests and where applicable, stock, are excluded. Suggestions for where to set up vegetation monitoring plots are found in Appendix 1.

Take an environmental DNA (eDNA) sample of the Wai River:

An eDNA sample was taken in 2022 which gives a baseline of species present in the grander landscape.

Water samples should be taken from the outflows from the farm of Wai River annually.

eDNA gives a snapshot of what species are present in your waterways, both native and invasive, and is an important step in identifying what exists within the catchment. The equipment is simple to use, further information and directions can be found at:

<https://www.wilderlab.co.nz/directions>. Although eDNA will give you an indication of native species present in the waterway it can't be used to show how well the population of a species is doing and how many individuals there are. There are other methods to assess these but require specialists' gear and knowledge to produce robust data.

Benefits for Biodiversity

Understanding what species are on the property and how their presence is changing because of management actions will influence future decisions on how to manage these species to further increase biodiversity on your property.

Effects on Farm Business

Monitoring changes in biodiversity on the farm is likely to become important as local and international customers are increasingly looking to source products from farms that operate to environmentally high standards and this is likely to become important as new regulations come into effect. It is important to have a record of any biodiversity enhancement conducted on your property.

Goal 8: Review of Biodiversity Management Plan

It is important that this biodiversity plan isn't just a one-off exercise and that it is reviewed regularly and the results from monitoring are used to guide future management. While the whole biodiversity plan will have a substantial review every 5 years, annual reviews and updates to the 5-year operational plan are considered essential and should be undertaken. An annual review is also important because this plan is designed to be able to meet the needs of regulators and market auditors.

Review this biodiversity plan at the same time as setting the overall farm work programme and budget for the next year. This review will include:

- Summarising the results of monitoring information from the past year.
- Undertaking a review of biodiversity management achievements against what we have proposed and assessing why the management actions did or did not work.
- Undertake planning for both the next year and the next five-year period, which will include updating the operational plan.

Benefits to biodiversity

Having a structured approach to planning biodiversity restoration work will increase the likelihood of biodiversity management actions being undertaken.

Effects on farm business

Having records of biodiversity work undertaken and the results of monitoring may become important to comply with future regulations.

Goal 9: Install additional water tanks, a reticulated water system and troughs.

There are numerous waterways throughout the farm that will need to be fenced off to prevent damage to the banks and beds of the streams, which ultimately harms freshwater biodiversity. Some waterways are the only access for water for stock and therefore fencing them off will have negative impacts on animal welfare and production. Therefore, before these waterways can be fenced off, additional water tanks, reticulated water systems and troughs need to be installed to ensure stock has access to water. Upon completion of this task, plans to fence off the waterways can be drawn up and will likely be part of the next 5-year plan period.

Benefits for Biodiversity

Stock will no longer have to access the waterways solely for water. A reduction in stock accessing the waterway will minimise damage to the banks and beds of the waterways. This will allow native biodiversity to be less disrupted and more likely to recover.

Effects on Farm Business

Livestock health generally improves when drinking out of troughs instead of waterways, improved health can result in greater production.

5-Year Operational Biodiversity Action Plan

This work plan outlines the tasks that will be necessary for achieving high-quality biodiversity management outcomes on Mahinga Hipi Farms that address the long-term vision for the property. The plan is written as a 5-year calendar so that biodiversity management actions can be easily scheduled into the working year with a draft budget included for anticipated costs.

This calendar should be reviewed and updated annually alongside your normal farm management planning so that you have the flexibility to carry out the work when you have the capability and make changes in the face of unexpected events. Costs are written as estimates only using today’s market prices.

Mahinga Hipi Farms Calendar and Costings for Biodiversity Management Actions.															
Time of year								Cost per year (\$)						Notes	Done
Goal 1: Stock exclusion of the Wai River															
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027		
Fencing section A	Site-specific			May						10,640				1520m of 2 wire @ \$7/m	
Fence section B	Site-specific				May						10,780			1540m of 2 wire @ \$7/m	
Fence section C	Site-specific					May						7,350		1050m of 2 wire @ \$7/m	
Total:							0	0	10,640	10,780	7,350	0	Total cost over 5 years:	28,770	
Goal 2: Enhancement of main bush block															
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027		
Fencing	Bush block		May						11,600					580m of 8 wire @ \$20/m	
Pest control line	Bush block		June						4,320					32 Doc 200's @ \$ 135ea	
Servicing trapline monthly	Bush block		On-going	On-going	On-going	On-going	On-going		60	120	120	120	120	\$10 a month for supplies only	
Culling of deer and goats	Whole farm	On-going	On-going	On-going	On-going	On-going	On-going		750	750	750	750	750		
Total:							0	15,980	120	120	120	120	Total cost over 5 years:	16,460	
Goal 3: Protection of remnants															
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027		
Fencing west remnant	Site specific		May						7,500					375m of 8 wire @ \$20/m	
Fencing east remnant	Site specific		May						15,000					600m of deer netting @ \$25/m	

Pest control line	Site specific	May					2,295					17 Doc 200's @ \$ 135ea				
Servicing trapline monthly		On-goin g	On-goin g	On-goin g	On-goin g	On-going		30	60	60	60	60				
Total:							0	24,825	60	60	60	60	Total cost over 5 years: 25,065			
Goal 4: Stock of exclusion of wetland.																
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027			
Fencing wetland	Deer shed wetland						May						34,500	1,725m of 8 wire @ \$20/m		
Total:							0	0	0	0	0	34,500	Total cost over 5 years: 34,500			
Goal 5: Blackberry control in wetland																
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027			
Spray blackberry	Fenced wetland	Feb					1,360					\$160 for 2kg of metsulfuron-methyl. 2 days of control @ \$600 a day				
Follow up control	Fenced wetland				Feb	Mar	Apr	May	300			300	300	300	Use leftover chemicals from the initial purchase. Half day of control @ \$600 a day	
Total:							0	1,360	300	300	300	300	300	Total cost over 5 years: 2,560		
Goal 6: Investigate the presence of native species																
Action	Location	2,022	2,023	2,024	2,025	2,026	2,027	2,022	2,023	2,024	2,025	2,026	2,027			
Spotless crane investigation	Fenced wetland	Oct						0						Listen for calls around sunset between Oct-Dec		
Kiwi investigation	Office	Oct						0						Contact the local DoC office and/or council		
Bat investigation	Office	Oct						0						Contact the local DoC office and/or council		
Total:							0	0	0	0	0	0	0	Total cost over 5 years: 0		
Goal 7: Establish biodiversity monitoring																
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027			
Establish automated acoustic bird monitoring	Site-specific	Oct						479	79			79	79	79	1 recorder @ \$479 and cloud storage @ \$79 each year.	
Vegetation monitoring	Site-specific	Nov					475					Summit Tite Grip Netting 13 Line 190cm x 30cm x 100m @475 a spoll. 50m needed for each plot				
Establish photo point monitoring	Farm wide	Nov						0						Suggested photo point locations are provided with the biodiversity management plan. Approx. 1-2 hours of work required to take initial photos and mark locations		
Repeat photo point monitoring	Farm wide	Nov		Nov	Nov	Nov	Nov	0		0	0	0	0			

Take eDNA samples	Wai River					Oct						510		1 x Comprehensive freshwater eDNA packages @\$255 ea	
							Total:	479	475	79	79	589	79	Total cost over 5 years:	1,780
Goal 8: Annual management plan review															
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027		
Undertake an annual review of the biodiversity management plan	Office	Nov	Nov	Nov	Nov	Nov	Nov	0	0	0	0	0	0	Half-day reading management plan, ticking off completed actions and scheduling actions for the year ahead. Do this in conjunction with farm business planning.	
Develop goals for the next 5 year							Jan						0	Start thinking about what actions and goals you want to accomplish in the next 5-year period	
							Total:	0	0	0	0	0	0	Total cost over 5 years:	0
							Total cost each year	479	42,640	11,199	11,339	8,419	35,059	The total cost of biodiversity management actions for 5 years:	109,135
Goal 9: Install water system															
Action	Location	2022	2023	2024	2025	2026	2027	2022	2023	2024	2025	2026	2027		
Install additional water tanks	Site specific													Farmer to fill in	
Upgrade the reticulated water system	Site-specific													Farmer to fill in	
Install troughs	Site-specific													Farmer to fill in	
														Total cost over 5 years:	0

Appendix 1 Biodiversity Monitoring

Understanding which species are on the property and how their presence is changing because of management actions will influence future decisions on how to manage these species to further increase biodiversity on your property.

Automated Acoustic Bird Monitoring

Forest bird activity can now be monitored with an automated recording device. Installing one of these in a biodiversity area where the vegetation is likely to develop over the next 5-10 years, because of your management work, is a good way to prove your impact on biodiversity. Areas that have been planted with native species or existing forests and wetlands that have a new pest control programme and/or have been fenced from stock are ideal sites to monitor for increases in bird activity.

Automated bird recorders should be installed where they are easy to access but are sheltered from noise created by roads, machinery and stock, as this can interfere with your monitoring results.

Recorders run all day and should be set to collect data over the whole year. Recorders with solar panels are the best option. It is important to keep detailed records about where the recorders are and if recorders are rotated around the property.

If there is cell phone coverage where the recorders are located, acoustic data will be automatically uploaded to the cloud. If there is no coverage, recorders will need to be checked regularly to back up data, this will need to be done every 3-12 months, depending on the storage capacity option chosen.

To back data up you will need to copy files from the recorder's memory and upload them to a cloud service provided by 2040 Limited. Once uploaded, the data will be analysed and will be made available for you to access.

Currently, only one company in the country manufactures automated bird recorders and offers an analysis of the data. Equipment for automated acoustic bird monitoring can be bought at this link:

<https://www.2040.co.nz/collections/cacophonometer-bird-monitoring>.

Photo point Monitoring

Photo points should show an area of land where you expect to see a change in vegetation over time. Any areas where you are undertaking biodiversity management work (e.g., planting, weed control, stock fencing) should have photo points installed before work commences so that you can demonstrate that you are carrying out biodiversity monitoring and prove the implementation of your plan.

This method entails taking photos from the same location, in the same direction at the same time every year. Early summer (November-December) is the best time to photograph native vegetation after the flush of growth in spring but before vegetation starts to die back in mid-summer. Installing a waratah is a good way to mark the location of where to take the photos from. Place your photo points near well-travelled tracks or roads so they are not a chore to reach in future.

Aligning the frame of repeated photos is key. It is recommended that you take copies of the original photos out with you when taking follow-up photos to ensure that you are pointing the camera in the same direction (consider using a compass bearing) and showing the same trees year after year. Relying on your memory to aim and frame the picture correctly usually produces poor results.

Panoramas made of multiple pictures taken from the same point may be useful for photographing wide areas of vegetation. The panorama feature on your phone's camera may be effective but it can stretch or compress the scene resulting in degradation in the quality of your biodiversity monitoring data.

More information about photo point monitoring can be found here:

<https://www.nzpcn.org.nz/conservation/monitoring/photo-points/>

Freshwater Monitoring:

Environmental DNA (eDNA) can be collected from streams and used to detect the presence of animals and plant species in the catchment above. This monitoring method does not provide any information on the

overall health of a catchment's freshwater or terrestrial biodiversity, but it is a cheap and simple way of detecting which species are living there. Repeated sampling over several years will give you information useful for directing future biodiversity management work and may show increases or decreases in a catchment's biodiversity over the long term. This is a new technology that is rapidly improving and we hope this method of measuring biodiversity in freshwater will grow to replace comprehensive monitoring techniques over the next 5-10 years as it could save a considerable amount of time and money. eDNA monitoring works best when the stream is not running high, and the weather is stable so this job has been scheduled for summer.

The only supplier for this service can be found at: <https://www.wilderlab.co.nz/order>. You will receive a report summarising all the organisms detected in your stream water. Please see an example report here: <https://s3.ap-southeast-2.amazonaws.com/wilderlab.openwaters/reports/df3cee2238757344.html>.

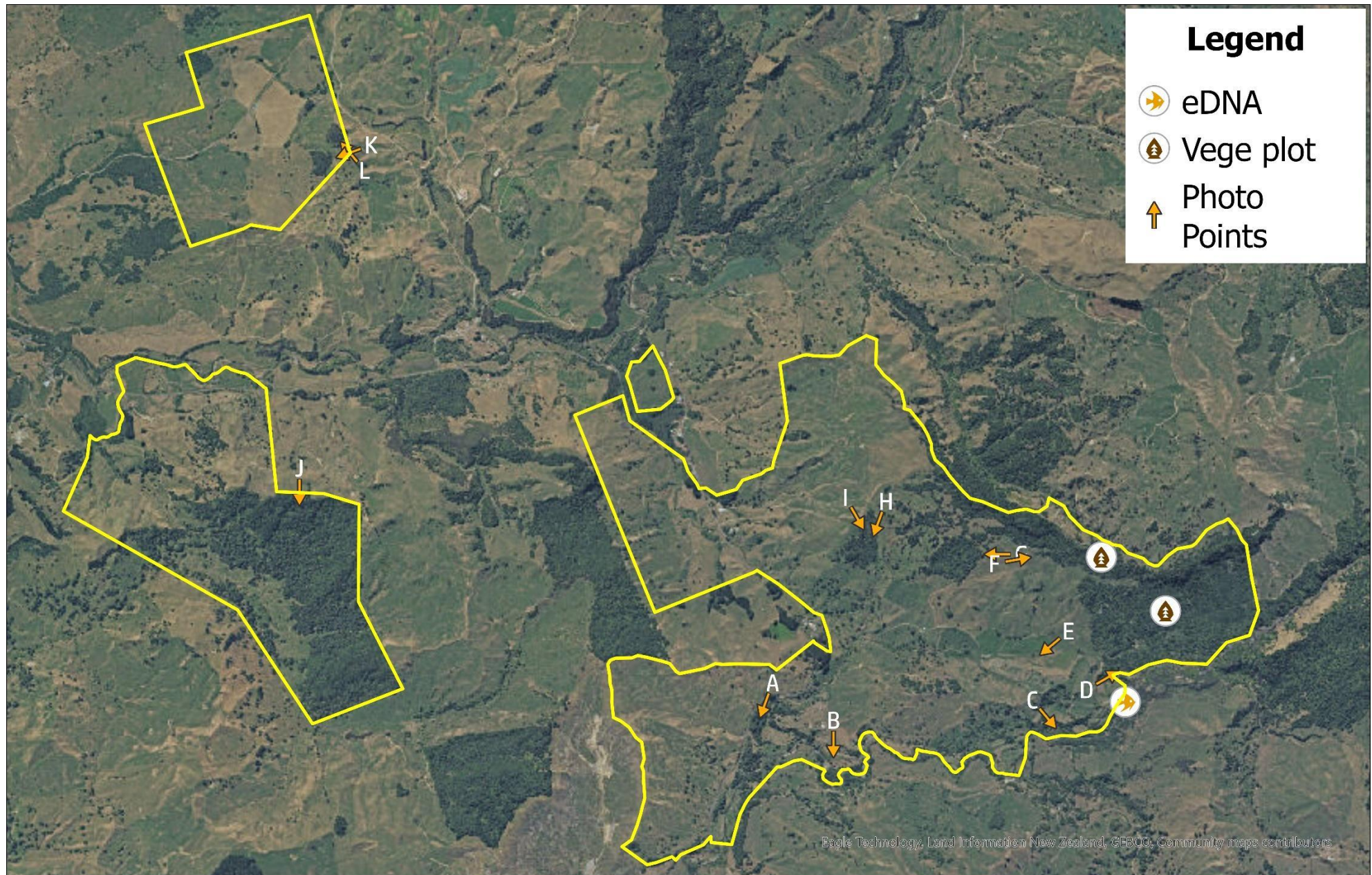
A more comprehensive freshwater assessment requires the use of a Stream Health Monitoring and Assessment Kit (SHMAK) or Wetland Monitoring and Assessment Kit (WETMAK). These methods provide a much better picture of stream or wetland health but require significantly more training and investment to be used effectively. If possible, purchase a kit within your catchment or community conservation group to share the costs. You may need someone with freshwater ecology knowledge to assist you.

SHMAK and WETMAK manuals and kits:

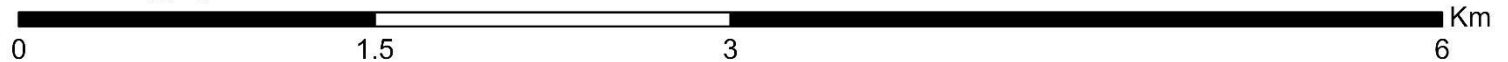
https://niwa.co.nz/sites/niwa.co.nz/files/SHMAK_orderform_Sept2021.pdf

<https://www.landcare.org.nz/resource-item/wetmak>

<https://niwa.co.nz/our-science/freshwater/tools/shmak/shmak-manual>



Biodiversity monitoring points



Appendix 2: List of Plants Found at Mahinga Hipi Farms

Common Name	Māori Name	Scientific Name	Conservation status
Bastard Grass		<i>Carex horizontalis</i>	Not Threatened
Bidibid	piripiri	<i>Acaena anserinifolia</i>	Not Threatened
Bracken	rarauhe	<i>Pteridium esculentum</i>	Not Threatened
Bullrush	raupō	<i>Typha orientalis</i>	Not Threatened
Bush Lawyer	tātarāmoa	<i>Rubus cissoides</i>	Not Threatened
Bushman's Friend	rangiora	<i>Brachyglottis repanda</i>	Not Threatened
Climbing Clubmoss		<i>Pseudodiphasium volubile</i>	Not Threatened
Climbing Rātā		<i>Metrosideros fulgens</i>	Threatened & Nationally Vulnerable
Common Duckweed		<i>Lemna disperma</i>	Not Threatened
Crêpe Fern	heruheru	<i>Leptopteris hymenophylloides</i>	Not Threatened
Cutty Grass	rautahi	<i>Carex lessoniana</i>	Not Threatened
Hangehange		<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>	Not Threatened
Hanging Spleenwort		<i>Asplenium flaccidum</i>	Not Threatened
Hebe		<i>Veronica corriganii</i>	Not Threatened
Hen And Chicken Fern	pikopiko	<i>Asplenium bulbiferum</i>	Not Threatened
Hīnau		<i>Elaeocarpus dentatus</i> var. <i>dentatus</i>	Not Threatened
Horoeka		<i>Pseudopanax crassifolius</i>	Not Threatened
Hound's Tongue	kowaowao	<i>Zealandia pustulata</i> subsp. <i>pustulata</i>	Not Threatened
Kahikatea		<i>Dacrycarpus dacrydioides</i>	Not Threatened
Kāmahi		<i>Pterophylla racemosa</i>	Not Threatened
Kiwikiwi		<i>Cranfillia fluviatilis</i>	Not Threatened
Koromiko		<i>Veronica stricta</i> var. <i>stricta</i>	Not Threatened
Lace Fern		<i>Leptolepia novae-zelandiae</i>	Not Threatened
Large-Leaved Coprosma	kanono	<i>Coprosma autumnalis</i>	Not Threatened
Large-Leaved Muehlenbeckia	pōhuehue	<i>Muehlenbeckia australis</i>	Not Threatened
Leathery Shield Fern		<i>Rumohra adiantiformis</i>	Not Threatened
Māhoe		<i>Melicytus ramiflorus</i>	Not Threatened
Mānuka		<i>Leptospermum scoparium</i> var. <i>scoparium</i>	At Risk & Declining
Marbleleaf	putaputawētā	<i>Carpodetus serratus</i>	Not Threatened
Mataī		<i>Prumnopitys taxifolia</i>	Not Threatened
Mingimingi		<i>Leucopogon fasciculatus</i>	Not Threatened

Miro		<i>Pectinopitys ferruginea</i>	Not Threatened
Mountain Celery Pine		<i>Phyllocladus alpinus</i>	Not Threatened
Mountain Fivefinger		<i>Pseudopanax colensoi</i> var. <i>colensoi</i>	Not Threatened
Mountain Tōtara		<i>Podocarpus laetus</i>	Not Threatened
Native Nettle		<i>Urtica sykesii</i>	Not Threatened
New Zealand Jasmine		<i>Parsonsia capsularis</i> var. <i>capsularis</i>	Not Threatened
Nz Honeysuckle	rewarewa	<i>Knightia excelsa</i>	Not Threatened
Pōkākā		<i>Elaeocarpus hookerianus</i>	Not Threatened
Pukatea		<i>Laurelia novae-zelandiae</i>	Not Threatened
Purei		<i>Carex secta</i>	Not Threatened
Red Horopito		<i>Pseudowintera colorata</i>	Not Threatened
Red Mapou		<i>Myrsine australis</i>	Not Threatened
Rimu		<i>Dacrydium cupressinum</i>	Not Threatened
Rough Tree Fern	wheki	<i>Dicksonia squarrosa</i>	Not Threatened
Seven-Finger	patē	<i>Schefflera digitata</i>	Not Threatened
Shining Spleenwort	huruhuruwhenua	<i>Asplenium oblongifolium</i>	Not Threatened
Sickle Spleenwort		<i>Asplenium polyodon</i>	Not Threatened
Silver Fern	ponga	<i>Cyathea dealbata</i>	Not Threatened
Smith's Tree Fern	kātote	<i>Cyathea smithii</i>	Not Threatened
Supplejack		<i>Ripogonum scandens</i>	Not Threatened
Tawa		<i>Beilschmiedia tawa</i>	Not Threatened
Tree Fuchsia	kōtukutuku	<i>Fuchsia excorticata</i>	Not Threatened
White Rātā		<i>Metrosideros diffusa</i>	Threatened & Nationally Vulnerable
Wineberry	makomako	<i>Aristotelia serrata</i>	Not Threatened