Tāne's Tree Trust
NATIVE FORESTS FOR OUR FUTURE
Hereherea te Wao-nui-a-Tāne

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Submission for

Proposals to redesign the permanent forest category in the NZ ETS Scheme

Submitted to

ETS Forestry Policy group, MPI

NaturalResourcesPol@mpi.govt.nz

25 August 2023

EXECUTIVE SUMMARY

Tane's Tree Trust (TTT) agrees that redesigning the permanent forest category is an opportunity to maximise the benefits of permanent forests, particularly native forests. **Our focus is on native forests, but we support a balanced approach** to incentivising carbon sequestration in exotic and native forests, as part of the ecosystem services forests provide. We believe there are roles for different types of forestry regimes with different species - as part of wise, sustainable land use.

TTT is a nation-wide organisation with over 700 members. Our vision is to support landowners in successfully establishing and sustainably managing native forest for all the benefits they provide. We have 13 trustees with a wide range of expertise. Over half have experience with exotic as well as native species. We are committed to scientific research as a base for best practice guidelines. We have field trials and project work throughout NZ that underpin our databases and resources. **Our resources are freely available to all**. We manage NZ's largest national database on planted natives with over 60 native tree and shrub species measured from over 100 stands, age 5 to 100+ years old.

We applaud Government's cautious approach to managing the long-term environmental and ecological risks of permanent exotic forests when redesigning the permanent forest category. **We are concerned about the limited data available for permanent exotic forests**, which makes it hard to judge the proposals, particularly regarding transitional forestry.

A major consideration of any permanent forest, or transitional forest, would be the degree of risk associated with it. This would include climate resilience, biosecurity issues and fire risks. **There is good evidence that multi-age, multi-species, permanent native forests are more likely to be resilient** to the impacts of climate change, than exotic monocultures. This is particularly important when considering areas that are likely to face higher fire risks, increased intensity and frequency of extreme weather events, and vulnerable areas, such as highly erodible steeplands.

There is a lack of definition of 'permanent forest' in the discussion document. **For a forest to be regarded as permanent, it must be self-perpetuating**, i.e., capable of continuing or renewing itself indefinitely without any significant outside intervention. Currently, there is no empirical evidence that any exotic forest in New Zealand can be regarded as permanent forest. However, there may be circumstances where long-lived exotics species could be appropriately managed as permanent forest, such as redwoods. There are native forests that lack appropriate browser management, and are unfenced from livestock, which could also not be considered 'permanent'.

TTT recommends that special recognition be given to native forests within the permanent forest category of the ETS.

At present there is insufficient research and evidence-based management practices to guide and inform policymakers and regulators on where permanent exotic forest is appropriate, and where and how transitions to native forest can achieved. This is a focus of a recently initiated research project.

A 5-year transitional forestry research project was launched late last year by TTT and partners. Managing transitions from exotic forest to native is complex, subject to many variables, and very site and context dependent. LUCAS data is being explored, and forestry trials will be established to collect data in existing exotic stands of various ages, on a range of sites throughout NZ - to determine factors and interventions that are likely to allow a transition to native forest. Drivers of natural regeneration will be explored, such as levels of canopy cover (light ingress), seed source proximity, browser pressure, climatic variables, and site factors - to inform what types and levels of management are required, and identify situations where a transition is more likely to be successful (or unsuccessful).

Subsequently, guidelines and recommendations will be made publicly available.

There are three very different applications for transitional forestry:

1) Carbon farming with non-harvest exotic species, principally radiata pine, with the proposition that the exotic canopy will be transitioned to native forest over time.
2) Transitioning from exotic to mature native forest, and avoiding clear-felling, on vulnerable or threatened land, e.g., highly erodible steepland, or dunelands where the best option is a managed transition back to native forest.
3) Forests managed in a continuous cover forestry regime, whereby the species change over time.

We are concerned that the ETS currently incentivises #1 - Permanent exotic carbon forests, which may have long-term unintended negative consequences if not well managed. While radiata pine is an excellent plantation species, it is not long-lived. Non-harvest, radiata-pine carbon forests are an experimental land use hampered by a lack of data and a corresponding lack of evidence-based management practices on transition to native forest. However, early indications from the transitional forestry research project can provide some guidance.

While TTT does not advocate for carbon farming with non-harvest exotic species, the 'horse has bolted' and this form of forestry land use needs urgent research and monitoring to ensure transitional objectives are being achieved.

It has been assumed by some that when radiata-pine stands disintegrate they will be automatically replaced by naturally regenerating native forests. This is an unrealistic premise. Apart from the necessity of nearby native seed sources and on-going pest control, early evidence from the transitional forestry research project indicates that some areas of New Zealand will require greater intervention to transition radiata-pine forest to permanent native forest, and with current knowledge, this cannot be assured. Another concern is that disintegrating, senescent radiata-pine stands can be dangerous to work in.

Particularly, we are concerned that in some cases this practice is being inappropriately exploited for short-term commercial gain by parties who do not have a long-term vested interest in ensuring a legacy of permanent forest cover. There is a conflict between maximising income from carbon sequestration and effecting a transition to native forest. There is also a significant social-license-to-practice problem, which undermines the ETS and NZ's efforts to combat climate change.

There are currently no regulations or incentives for carbon farming investors to budget for, or invest in, the work required to manage a long-term transition to natives.

In regard to the policy on transitional forestry – we caution against forming policy before definitive science results are available. However, we understand that regulation is urgently needed, but it must have the proviso that policy will be amended as results of research on transitional forestry become available, i.e., an adaptive management approach.

To help mitigate the risks associated with non-harvest carbon forests, the following are needed:

- Professionally prepared, assessed, and reviewed Forest Management Plans, registered on the land title/s.
- Monitoring processes to ensure appropriate practices are being carried out and transition objectives are being achieved to manage a transition to permanent native forest.
- Some sort of bond or requirement for a suitable insurance policy, should there be failure to transition to native forest.

In regard to transitional forestry application #2, above, there is now wide acknowledgment from the forestry industry that plantation forestry regimes on highly erodible land are no longer tenable and need to be transitioned back to permanent native forest. TTT supports this process. Indeed, this is a major driver for the transitional forestry research project.

The Ministerial Inquiry report identified the urgent need to create policy and incentives to support desirable land-use change that will help heal the land. However, it did not address how existing plantations and farmland in the 'purple zone' could be transitioned into permanent forest for catchment protection. **This will likely require government support**.

TTT recommends that incentives are created to expedite transition of clear-fell plantation forestry to permanent native forest in sensitive, highly erodible catchments. This is particularly urgent in places such as Tairawhiti, where there have been significant issues with slash debris, erosion and sedimentation during extreme weather events, causing considerable damage to downstream communities, infrastructures, and ecosystems.

TTT strongly agrees with these statements in the Ministerial Inquiry report:

- "We urgently need to create a biodiversity market to operate symbiotically with the ETS";
- "The ETS in its current form has created perverse land use outcomes and elements need to be reviewed"; and
- "To incentivise permanent indigenous forests, Aotearoa New Zealand must develop and implement a biodiversity credit scheme, which would complement and counterbalance existing carbon markets".

We believe that a comprehensive and effective package of ETS and non-ETS incentives is required to encourage native forest cover and ensure ongoing forest management.

There has been huge investment into R&D on establishment of exotic forest, particularly radiata pine. In contrast, there has been paltry attention to establishment and management of native forest. However, research is underway on cost-effective establishment of native forest at landscape-scale by TTT and other organisations, including Manaaki Whenua Landcare Research. Some of this research is reliant on philanthropic investment. Since the billion-trees funding was cut short, government investment into establishment and management of native forest is urgently needed.

We request that policymakers focus on scientific evidence provided by those with expertise. Unfortunately, there is misinformation circulating on native forests promulgated by individuals who have no expertise in growing natives. This includes misinformation on the ability of native forest species to sequester carbon. The current MPI Look-up table for natives is based on (and is accurate for) unmanaged regenerating shrubland on relatively unproductive land, and this is routinely compared with data from managed radiata-pine plantations. It is not an equitable comparison.

Published research on carbon sequestration demonstrates that managed, planted indigenous forest is better at sequestering carbon than commonly considered. TTT's database represents the most comprehensive set of planted native tree and shrub measurements. While native species do not have the initial very fast growth of radiata pine, once established, there are native species that grow at rates close to that of exotic forestry species and will continue to do so for many decades.

TTT is happy to provide further evidence to MPI, in the form of data and insights around all aspects associated with native forests and exotic to native transitions, relevant to the proposed changes.

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

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DETAILS OF SUBMITTER – Tāne's Tree Trust

- **Tāne's Tree Trust (TTT) was established in 2000**, with the vision to support landowners in successfully establishing and sustainably managing native forest, for all the benefits they provide – https://www.tanestrees.org.nz/
- Our resources are freely available to all – https://www.tanestrees.org.nz/resources/
- **TTT is a nation-wide organisation** with 13 trustees, who have expertise in forestry science, management, restoration, conservation, ecology, genetics, physiology, economics, policy; & farm forestry, dry stock farming, landscape architecture, rongoa, Wai 262, & sustainable land use.
- **TTT currently has 701 members** throughout NZ, including Tairawhiti and other vulnerable areas.
- We are among the best informed and most experienced at native forestry in NZ.
- **We have a comprehensive R&D work programme,** which is described in our Annual Report – https://www.tanestrees.org.nz/site/assets/files/1037/ttt_annual_report_2022.pdf with a summary provided in (APPENDIX 1).
- **We are committed to scientific research** as a base for best practice guidelines.
- **We embrace the broader concept of forestry**, i.e., the science and craft of establishing, restoring, and managing forest for all the benefits it provides for humanity and the environment.
- **We are highly qualified and experienced**. Between us we have 43 years' experience in government organisations, 55 years in academia, 68 years in CRI research positions, 70+ years in technical roles and private consulting, and 100+ years in professional forestry management.
- **We manage NZ's largest national database** on planted natives with over 60 different native tree and shrub species measured throughout NZ from over 100 stands, aged 5 to over 100 years old.
- **We have field trials throughout NZ** that underpin our databases and development of resources.
- **TTT advocate for and have expertise in continuous cover forestry (CCF) systems**, as the many benefits associated with forest cover are retained.
- **We have developed an online Native Forest Toolkit** https://toolkit.tanestrees.org.nz/ which draws on scientifically robust data from **TTT's Indigenous Plantation Database.** It includes Calculators for Planting & Budgeting, Growth & Yield, Economics, and Carbon Sequestration.
- **The Carbon Calculator:** https://www.tanestrees.org.nz/resource-centre/carbon-calculator/?highlight=carbon+calculator is for planted native forest. TTT data shows that the Look-up tables for native forest significantly underestimate C sequestration in planted, managed native forest – https://pureadvantage.org/carbon-sequestration-by-native-forest-setting-the-record-straight/ (see APPENDIX 3).
- **We are researching a range of options to cost-effectively establish native forest at landscape scale**, including assisted natural regeneration and use of seed islands (see APPENDIX 4).
- **TTT is currently developing a fact sheets series**, to assist those establishing and managing native forest to meet multiple objectives. These will soon be uploaded to our website.
- **TTT hold's workshops & training throughout NZ,** for iwi, NGOs, Councils, catchment groups, educational and community organisations, etc.
- **TTT co-hosted (with Pure Advantage) a conference at Te Papa**, Wellington, in October 2022 – *O Tatou Ngāhere – Regenerating our landscape with native forest.* Over 1,000 people attended, breaking records for a forestry conference in NZ.
- **TTT have expertise in and are proponents of continuous cover forestry:** https://www.tanestrees.org.nz/site/assets/files/1069/continous_cover_forestry_-_web.pdf
- Several trustees have hands-on experience in sustainable indigenous forestry management via continuous cover forestry (CCF) regimes, under part 3A of the Forests Act.
- **TTT convenes the Northland Tōtara Working Group** and facilitate research into the sustainable management of this naturally regenerating native forest resource.
- **Over half our trustees have worked with indigenous species and exotic plantation species.**

We are happy to provide further information and are best contacted via office@tanestrees.org.nz

GENERAL COMMENTS

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

Thank you for the opportunity to submit on proposals to redesign the permanent forest category.

TTT's raison d'être is native forests, and this is our primary focus for this submission. This includes input on transitional forestry practices.

Our vision is to support landowners in successfully establishing and sustainably managing native forest for multiple purposes. This includes, but is not limited to, carbon sequestration, climate adaptation and resilience in the face of climate change.

TTT strongly supports the Climate Change Commission's advice for native forests to be a vital part of New Zealand's integrated response to the climate change crisis – in terms of carbon sequestration and climate change adaptation. This includes the policy direction and approaches recommended by Commission previous advice – *Ināia tonu nei*, to increase the amount of permanent native forest as a long-term carbon sink.

However, we purport that there are roles for different types of forestry with different species in New Zealand, particularly in an era of climate change - as part of wise, sustainable land use. Most of our trustees have experience with exotic, as well as native species, and several have farming interests, and are keen to see a balanced approach to forestry and farming land use.

There is a lack of definition of the term 'permanent forest' even though this is the main focus of the discussion document. Exactly what is a permanent forest? What assurances are there that a forest is indeed permanent?

For a forest to be regarded as permanent, TTT believe that it must be capable of continuing or renewing itself indefinitely without any significant outside intervention. With this in mind, currently, the only good evidence of permanent forest in New Zealand is our native forest, which has cloaked our land for millennia. Exotic forestry species were first introduced to New Zealand in the mid-1800s, so only have a short history in our country. In the words of our Chairperson Peter Berg, "The only forest which has been permanent for the last 80-100 million years and is well proven is NZ's natural forest". That said, there may be opportunities for management of exotic and native species in continuous cover forestry regimes, or establishment of long-lived exotic species, such as redwood.

TTT supports the revision of the permanent forest category to help reduce the barriers to indigenous afforestation, but we advise an abundance of caution regarding incentivising establishment of non-harvest carbon forests with exotic species. We are grateful to see that a cautious approach to redesigning the permanent forest category is signalled on page 14 of the discussion document.

There are three very different applications of transitional forestry (exotic-to-native forest transitions):

1) Carbon farming with non-harvest exotic species, principally radiata pine, with the proposition that the exotic canopy will be transitioned to native forest over time.
2) Transitioning from exotic to native forest, and avoiding clear-felling, on vulnerable or threatened sites such as highly erodible steepland or dunelands where the best option is a managed transition back to native forest.

3) Forests intensively managed in a Continuous Cover Forestry (CCF) regime, whereby the species change over time (e.g., from predominantly exotic, to a mix of exotic and native).

The first application, i.e., carbon-farming with exotic species as incentivised by the ETS, has become a contentious issue. There has been considerable backlash, particularly from rural communities, the agricultural sector, and eNGOs. While TTT does not advocate for this form of carbon farming, such stands have already been established. There is an urgent need for research and guidance on transitional forestry management practices, and regulations that ensure a transition will happen. We are particularly concerned about 'plant and leave' radiata-pine carbon forestry, where there are no clear procedures in place for a managed transition to native forest.

With the second type of application of transitional forestry, there are potential opportunities in exotic-to-native forest transitions that could provide multiple benefits to the environment, economy, and society – as described below. There is now wide acknowledgment (including from the forestry industry) that **clear-fell plantation forestry is no longer appropriate on highly erodible steeplands and needs to be transitioned back to permanent forest cover, preferably native forest.** TTT supports this process. Indeed, this is a major driver for the transitional forestry project, as described below.

The third type of forest management under CCF regimes is ideally suited to integrating small, multi-purpose woodlots and forests onto farms and rural production landscapes. A great diversity and changing mix of species can be accommodated in such forest areas and be considered '*permanent*' as long as the forest canopy cover is maintained.

Regarding the statement on page 13 (and elsewhere) on high establishment costs for natives. TTT agrees that currently there are **barriers to rapidly upscaling native forest cover due high costs of planting stock, lack of infrastructure and expertise, the complexity and diversity of our native forests, and knowledge gaps** - due to decades of under-investment. This is in contrast to the massive investment in R&D and infrastructure around exotic species, particularly one species – *Pinus radiata*.

Addressing these issues is a major focus of Tane's Tree Trust's R&D work programme, as described in our recent Annual Reports[1,2] and summarised in APPENDIX 1. There is considerable potential to expand our native forest resources at landscape-scale on private land in cost-effective ways, which should be better supported by investment into R&D. TTT's recommended way to establish native forest is either via planting or assisted natural regeneration. However, we do not want the door closed on opportunities to transition from exotics to native forests, particularly where it pertains to the transitional forestry application #2 above.

TTT is keen to see policy and messages from Government that creates a constructive shift of thinking away from the farming-versus-forestry, and exotic-forests-versus-native polarised mentalities, towards a balanced approach of inter-woven land use, creating greater climate resilience and economic stability, and doing right by the land and the people.

TTT advocates for policy that encourages a balanced mosaic of land uses, rather than blanket land use, i.e., productive land uses interwoven with natural ecosystems, to provide greater environmental sustainability – including climate resilience and improved biodiversity values and

[1] Tane's Tree Trust Annual Report 2021 - https://www.tanestrees.org.nz/site/assets/files/1037/ttt_annual_report_2021.pdf
[2] Tane's Tree Trust Annual Report 2022 - https://www.tanestrees.org.nz/site/assets/files/1037/ttt_annual_report_2022.pdf

hence greater economic and social stability. We think that policymaking should support this more nuanced approach, with the well-being of the land and the people taking top priority.

In the context of carbon markets and high carbon prices, there are risks of bio-perversity[3], which needs to be considered by policymakers. This is where negative biodiversity and environmental outcomes arise due to a narrow focus on single environmental problems without consideration of the broader context, i.e., **a narrow focus on carbon sequestration can potentially create negative outcomes** if protection and enhancement of other values such as biodiversity are not considered.

We support the proposed "redesign of the permanent forest category to maximise the benefits of permanent forests" (Page 14 of discussion document).

We believe that the advent of 'plant & leave' radiata-pine carbon forests is a perverse outcome of well-intended policy. It is important that in New Zealand's haste to encourage afforestation and carbon sequestration, that we do not end up creating perverse outcomes and problem landscapes for future generations to deal with. Unfortunately, at present there is limited research and evidence-based management practices to guide and inform policymakers and regulators on where permanent exotic forest is appropriate, and where and how transitions to native forest can achieved. We need to work with what knowledge we have and follow an adaptive management approach.

TTT agrees with the comment on page 6 of the discussion document - **"**While the Maximising Forest Carbon Programme will help understand how transition forests could work in the NZ ETS, **a significant body of work will be required to provide practical guidance for landowners to successfully manage a transitional forest.**" This is discussed further below.

TTT also agrees with the comment on page 11 – "**There is also a lack of empirical evidence about their long-term environmental, financial and forest management consequences. Consequently, establishing widespread transition forests presents an unknown degree of risk**"[4]. However, there is a greater known risk in not taking action in sensitive environments where a transition from clear-fell plantations to native forest is urgent. This 'lack of information' has been one of the main reasons why clear-fell forests that foresters agree should not be replanted, are replanted, so setting up the land for yet another cycle of degradation. (See our responses to Q.1, below, regarding the Ministerial Inquiry and situation in Tairawhiti).

Landowners need to be able to access enough support to establish natives where this is appropriate to the land. However, TTT also recognises that there is now wide acknowledgment that plantation forestry regimes on highly erodible land are no longer tenable and need to be transitioned back to permanent forest cover, preferably native forest. TTT supports this process. Indeed, this is a major driver for the transitional forestry project, as described below and in APPENDIX 2.

TTT acknowledges reference to the Forestry and Wood Processing Industry Transformation Plan in the discussion document for the permanent forest category. This ITP represents the collective government-industry vision for transforming the sector, and includes the sector's contribution to

[3] Lindenmayer, D. B.; Hulvey, K.; Hobbs, R.; Colyvan, M.; Felton, A.; Possingham, H.; Steffen, W.; Wilson, K.; Youngentob, K.; & Gibbons, P. (2012). Avoiding bio-perversity from carbon sequestration solutions. Conservation Letters 5: 28 - 36. https://doi.org/10.1111/j.1755-263X.2011.00213.x

[4] Forbes Ecology (2021). Transitioning exotic plantations to native forest: A report on the state of knowledge. Report prepared for Te Uru Ra-kau - New Zealand Forest Service.

climate change mitigation and adaptation. It also includes native forests interests and opportunities for continuous cover forestry, along with exotic plantation forestry.

There is a need for clear policy direction for forestry. Mixed messages and frequent policy changes have created uncertainty in the forestry industry. The NES-PF needs to revert to allowing regional councils greater control to restrict clear-fell forestry harvests in inappropriate areas. Improved management guidelines on riparian buffer establishment and permanent protection are also required. **We believe that a forestry cross-sector working party (possibly via NZIF, which is a pan-forestry organisation) would be useful in providing insight to policymakers**, particularly regarding sector-specific policies to support forest establishment and sustainable forestry practices, including input on transitional forestry regulation.

TTT is concerned that the NZ ETS is already a difficult scheme to negotiate for small growers and farmers, and the complexity and costs associated with the ETS are a barrier to participation[5]. We ask that policymakers avoid further complexity in policy and regulation which leads to further barriers.

TTT is highly supportive of the proposed Biodiversity Incentives Scheme and would like to see this proposed new policy adopted. **It would need to dovetail with other policy, including the permanent forest category in the ETS**. We think that Government must be part of this scheme and help fund it, rather than just rely on private investment, as implied in the discussion document. In general, well managed indigenous forests are much more likely to have better environmental and biodiversity values than comparable exotic forests[6]. If landowners could access biodiversity credits and carbon credits for the same site, this would encourage both carbon absorption and biodiversity enhancement.

TTT supports the Maximising Forest Carbon Programme (on page 6 of the discussion document). TTT can assist with parts of the programme relevant to native forests. Indeed, TTT is already supplying data and information on carbon sequestration in native forests to MPI. TTT are also liaising with the programme about synergies with the TTT Transitioning Exotic Forest to Natives research project (abbreviated as transitional forestry project).

Regarding statements on slower carbon sequestration by natives, e.g., on page 13, and also near the top of page 14 – "This is because exotic forests grow and sequester carbon quicker than indigenous species, are cheaper to establish than indigenous species, and permanent exotic forests earn NZUs for longer than production forests."

TTT challenges the first part of this statement. Indigenous tree species are not necessarily slower growing and sequestering carbon. Recently published research on carbon sequestration, based on TTT's databases, demonstrates that well-managed, planted indigenous forest is better at sequestering carbon and faster growing than commonly considered (APPENDIX 3). While native species do not have the initial very fast growth of radiata pine (which is exceptional for a temperate conifer species), once established, there are native tree species that grow at rates similar to that of commercially planted exotic species and will continue to do so for many decades.

Unfortunately, the current Look-up tables are often quoted by people wanting to dismiss the potential carbon sequestration by native trees and undermine the call for planting more indigenous

[5] Hughes, R., & Molloy, P. (2017). Is the ETS worth the carbon it is written on for small-scale forest owners? New Zealand Journal of Forestry 61(4): 33-36.
[6] Aimers, J., Bergin, D., Horgan, G. (2021). Review of non-timber values in sustainably managed native forest in New Zealand. Tāne's Tree Trust bulletin, Hamilton, New Zealand. 119 pages. https://www.tanestrees.org.nz/site/assets/files/1099/non_timber_values_in_native_forests_-_web.pdf

forest. The current Look-up table for native species is based on unmanaged regenerating shrubland on relatively unproductive land, which is routinely compared with data from managed radiata-pine plantations. This is not an equitable comparison.

TTT's database represents the most comprehensive set of planted native tree and shrub measurements available. Data is collected across the full gamut of poorly managed through to well-managed stands. Most are on relatively unproductive land.

The widely held view that New Zealand's native forests are slower growing and accordingly slower to sequester carbon, as indicated by the MPI Look-up tables, may be discouraging landowners from planting native trees, even where it is their preference to do so. Worse, it may be leading to planting advice that is incorrect and not helpful at a time when any form of tree planting by landowners is a bonus.

TTT strongly recommends that domestic action (as opposed to offshore mitigation) is prioritised in the Nationally Determined Contribution (NDC) Strategy. Extending native forest cover, transitioning production forests on highly erodible steeplands to native forest, and restoring degraded native forest ('additionality') must all play a critical role in meeting the target.

Additionality is the 'low hanging fruit' for carbon sequestration in native forests. There are many hundreds of native forest stands on farmland throughout New Zealand that are slowly dying, most of which could be retrieved through intervention (APPENDIX 5). Fencing, pest animal and weed control can quickly result in a flip from carbon loss to carbon gain, plus a myriad of other ecosystem services.

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Responses to Consultation Questions

Recommendations from Ministerial Inquiry

Question 1: *How do you think the recommendations from the Ministerial Inquiry into Land Use Change in Tairawhiti and Wairoa should be reflected in proposals to redesign the permanent forest category?*

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TTT thinks that there are findings and recommendations from the Ministerial Inquiry that are highly pertinent to this consultation, as detailed below. The Inquiry made several recommendations related to the NZ ETS, and the redesign of the permanent forest category would help address some of the Inquiry's recommendations.

TTT has members within Tairawhiti and Wairoa regions. We have field trials throughout New Zealand, including project work in Tairawhiti and Hawke's Bay.

In many of NZ's highly erodible steeplands, plantation forestry operations are economically marginal due to logistical issues. Some of these forests, such as those in the Tairawhiti hinterlands, were planted primarily for catchment protection after Cyclone Bola. However, while the East Coast was still in post-Bola recovery mode, the Forestry Corporation was sold off and catchment protection became subservient to timber production and market forces. Subsequently, these forests were clear-felled when log process were high, and the land became highly vulnerable.

The commercial plantation forestry industry is now looking for advice on how to retire radiata-pine stands safely and cost-effectively on remote, erodible steeplands, which are not economical to harvest and/or pose environmental risks and where the best option is a managed transition back to native forest.

There is an urgent need for action, particularly in Tairawhiti, with the creation of appropriate permanent forests a critical factor in increasing the resilience of the region in the face of climate change. The Ministerial Inquiry report[7] identified the **urgent need to create policy and incentives to support desirable land-use change that will help heal the land,** e.g., **"We urgently need to create a biodiversity market to operate symbiotically with the ETS"** (pg 29).

The report recognises the "unintended consequences of successive government strategies and inadequate local authority intervention … " (pg 19). We also believe that 'plant and leave' radiata-pine carbon forestry is a perverse, unintended consequence of what was well-intended, but single-purposed policy, which could have significant negative consequences in the future, in Tairawhiti and elsewhere, unless there are appropriately managed transitions to native forest, as explained below.

It is a tragedy that the forests that were established primarily for catchment protection after Cyclone Bola became a source of forestry slash debris bombs that caused devastation downstream. The native forest cover that was historically destroyed in the steep hinterlands, would likely have contributed billions of dollars in ecosystem services, particularly in keeping vulnerable hillsides relatively stable, and reducing impacts to downstream communities, infrastructures, local

[7] Outrage to Optimism – Report of the Ministerial Inquiry into land uses associated with the mobilisation of woody debris (including forestry slash) and sediment in Tairawhiti/Gisborne District and Wairoa District - https://environment.govt.nz/assets/Outrage-to-Optimism-CORRECTED-17.05.pdf

economies, food production, and natural ecosystems. It would also have reduced the loss and trauma experienced by thousands of people impacted by extreme weather events.

In hindsight, it is abundantly clear that the original native forest cover should never have been removed from the Tairawhiti hinterlands, and that this forest would have more than 'paid for itself' economically, in terms of catchment protection. There is evidence to show that catchments clothed in native forest have shown greater stability[8]. While plantation forests provide land stability services for the majority of their rotation, after felling, clear-fell regimes of radiata-pine leave a vulnerable period of approximately 6 years, during which time there is a risk of erosion in high-intensity rain events[9,10] . So, attempts at amelioration of some of the erosion (by planting commercial forests) have themselves caused problems, particularly with the mobilisation of forestry slash.

Many existing pine plantation stands are best retired and left standing to protect the land while a change in management enhances the transition towards native forest over the longer term. To incentivise this land use change, such transitional forests could be allowed within the permanent forest category and eligible for carbon credits. This will include both pre-1990 and post-1989 forests as the change in management is an additionality in continued pine growth, as well as soil and understory protection. Transitional forests will need to be actively managed to meet transitional objectives over time.

TTT's submission to the Ministerial Inquiry is available on our website[11].

TTT's submission to the Ministerial Inquiry builds a case for alternative forestry regimes for climate resilience. It also covers transitional forestry issues, including the need to address knowledge gaps and develop management guidelines. Methods for cost-effective native forest establishment at landscape scale are also described. Most of our recommendations were independently reflected in submissions from other parties[12], and in turn, reflected in the Ministerial Report[13].

We believe that Tairawhiti is the 'canary in the coal mine' in regard to impacts of severe weather events associated with climate change. The geomorphology in Tairawhiti may create more vulnerability, but with the increased intensity of extreme weather events associated with climate change, there will likely be similar devastation in the near future in other parts of New Zealand. Learnings from the impacts of Cyclones Bola and Gabrielle, and the consequences of past land-use decisions, will have relevance to other erodible, steepland regions in New Zealand, such as in the Nelson/Tasman region.

Land-use decisions driven by policy changes must factor in the impacts of a changing climate and long-term implications of those land uses.

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[8] McMillan, Dymon, Jolly et al (2023). Rapid assessment of land damage - Cyclone Gabrielle. Contract Report: LC4292. Manaaki Whenua – Landcare Research

[9] Bergin, D.O., Kimberley, M.O., & Marden, M. (1995). Protective value of regenerating tea tree stands on erosion-prone hill country, East Coast, North Island, New Zealand. NZ Journal of Forestry Science, 25 (1), 3-19.

[10] Bloomberg, M., Cairns, E., Du, D., Palmer, H., & Perry, C. (2019). Alternatives to clear felling for harvesting of radiata pine plantations on erosion-susceptible land. NZ Journal of Forestry 64(3), 33–39.

[11] TTT's Submission for Ministerial Inquiry into Land Use in Te Tairāwhiti, Tūranganui-a-Kiwa and Te Wairoa. https://www.tanestrees.org.nz/site/assets/files/2431/tanes_tree_trusts_submission_for_ministerial_inquiry_into_land_use_in_tairawhiti_and_wairoa_-final_copy_1.pdf

[12] Ministerial Inquiry - Appendix 4 – Summary of Submissions - https://environment.govt.nz/assets/Appendix-4-Summary-of-Submissions.pdf

[13] Outrage to Optimism – Report of the Ministerial Inquiry into land uses associated with the mobilisation of woody debris (including forestry slash) and sediment in Tairawhiti/Gisborne District and Wairoa District - https://environment.govt.nz/assets/Outrage-to-Optimism-CORRECTED-17.05.pdf

There is always the risk of perverse outcomes from well-intended policy. TTT recommends that government agencies consult with, and take heed of, recognised industry groups when formulating new policy, before it goes out for public consultation. Potentially this could be organised via the NZ Institute of Forestry, as this is a pan-forestry organisation that includes experts associated with different types of forests and forestry regimes ranging from permanent native forests, to farm foresters and small woodlot owners, carbon forestry interests, through to clear-fell, corporate forestry interests with exotic species.

Findings and recommendations from Ministerial Inquiry relevant to this submission

TTT supports the following land-use findings and recommendations from the Ministerial Inquiry report, which have been copied from the report, in blue below. We have underlined points that are particularly relevant to this submission. Please note that the Findings and Recommendations listed below from the Ministerial Inquiry report are not the complete list - only findings relevant to this submission are included as excerpts below.

RELEVANT EXCERPTS FROM MINISTERIAL INQUIRY REPORT

LAND USE

Findings (relevant to this submission)

Enabling a mosaic of sustainable land uses (pg 19 - 20)

- Pg 19, #22. … Within the existing red zone, there is some land that is too susceptible to erosion to be used for forestry or farming. We propose this land needs to be identified in the Erosion Susceptibility Classification (ESC) as having 'extreme erosion susceptibility' and be mapped as a 'purple zone'. This land must be returned to permanent forest – preferably native – which would have the advantage of biodiversity co-benefits. ...
- Pg 20, #24. We know that the current Tairawhiti Resource Management Plan (TRMP) is out of date and urgently needs review. … The establishment of permanent exotic forests in inappropriate locations is of great concern to many in the region, and this needs to be addressed in the plan review.

Recommendations (relevant to this submission)

- Pg 21, R14. Direct officials to procure from Crown research agencies, a high-resolution soil erosion susceptibility map for Tairawhiti and Wairoa, that includes the identification of land with an extreme erosion susceptibility to create a new classification – a 'purple zone'.
- Pg 21, R15. Require land with an extreme erosion susceptibility to be transitioned from current uses to permanent canopy cover such as native forest.
- Pg 21, R18. Direct that the regional plan for Tairawhiti be reviewed (and, where applicable, that HBRC review its regional plan), with a focus on:
    - …
      R18.4. introducing land-use rules that control the location of permanent exotic monoculture forests established for carbon farming under the Emissions Trading Scheme (ETS).

FORESTRY

Findings (relevant to this submission)

- Pg 23, #32. Where exotic plantation trees are currently planted in the proposed purple zones, a specific harvest-management plan would set out how the removal of the plantation

trees will occur, how pests will be managed, and how to transition to appropriate permanent vegetation.

ECONOMIC INCENTIVES AND CONSTRAINTS

Findings (relevant to this submission)

- Pg 29, #46. The Panel found that the transition to a diverse mosaic of high-value land uses would be enabled by infrastructure and investment, especially for whenua Maori. We urgently need to create a biodiversity market to operate symbiotically with the ETS. Such action would also have the desirable effect of encouraging the retirement of exhausted land. The ETS in its current form has created perverse land use outcomes and elements need to be reviewed. …
- Pg 30, #49. To incentivise permanent indigenous forests, Aotearoa New Zealand must develop and implement a biodiversity credit scheme, which would complement and counterbalance existing carbon markets. …

FINANCIAL INSTRUMENTS AND THE EMISSIONS TRADING SCHEME

Findings (relevant to this submission)

- Pg 30, #50. The ETS is the major government economic instrument influencing forestry and land use in the region (and throughout Aotearoa New Zealand). The ETS forestry provisions as currently designed are focused on carbon sequestration and shorter time horizons and cannot deliver the biodiversity or longer-term land-use outcomes the community desires.
- Pg 30, #51. Although the ETS has created benefits in terms of supplementary income for production forests, it has also incentivised monoculture radiata pine forests and encouraged planting of trees in the wrong place (such as permanent carbon forest being planted on productive land).
- Pg 30, #52. An additional challenge is that whenua Maori is largely either in pre-1990 permanent forest (that is, not sequestering carbon[14]) or it is reverting bush, which is ineligible for ETS under the current rules. We do not agree with the argument for excluding reverting bush from the ETS, given the lack of other land-use opportunities (especially when land is also landlocked). Even when eligible, the cost of entry and administration often outweighs the benefits for Maori landowners. Further, there is opportunity to better align government grant schemes with the ETS, to reduce capital barriers for Maori landowners. Access to capital can also be improved through issuing green bonds or facilitating easier access to philanthropic investment.
- Pg 30, #53. To make better decisions around land use that can benefit future generations and help heal the land, we need to better integrate how the ETS incentivises different types of forests, and how other tools (such as grants, plans and regulations, and complementary incentives) can support desirable land-use change.
- Pg 31, #54. As part of the current review of the ETS, considerations need to include:
    - ensuring the RMA planning system (and the incoming Spatial Planning Act and Natural and Built Environments Act (NBA)) and ETS are better integrated, such as by excluding non-compliant forests from ETS registration or by the loss of credits gained

[14] **TTT challenges this assertion**. Pre-1990 forests will largely be sequestering carbon, particularly tall native forest that is comprised of long-lived species, but this is not recognised under the current ETS.

- incentivising indigenous and slower-growing exotics (such as through front-loading the earning of credits – effectively a loan, and not a fake credit)
- reviewing ETS look-up tables to better reflect the sequestration of carbon in indigenous forests
- extending the option for averaging to forests planted and registered in the ETS, which will provide more simplicity and security for forest owners
- including in the ETS pre-1990 natural forest that is still transitioning to permanent indigenous forests so that carbon sequestered post-1990 can gain credits.

Recommendations (relevant to this submission)

- R35. Direct the establishment of a world-leading biodiversity credit scheme to incentivise permanent indigenous forests, and the scheme should be piloted in the region.
- R36. Expand the current review of the Emissions Trading Scheme to include consideration of the matters in Paragraph 54 (above).

TTT highly recommends that the 'appropriate permanent vegetation' mentioned above in the excerpt from the Ministerial Inquiry report, is native shrubland, forest, and riparian vegetation. This will ensure better environmental outcomes, particularly biodiversity values.

The Ministerial Inquiry report did not address how existing plantations (and farmland) in the 'purple zone' could be transitioned into permanent forest for catchment protection. Many of the forestry stands on the steep hinterlands of Tairawhiti are economically marginal to uneconomical to harvest, particularly when log prices are low. **There is a danger** in the current economic and political situation, **that some radiata-pine stands will be abandoned. Possibly reclassification sought under the permanent forestry category will help avoid this,** as regaining some financial return will incentivise management of a transition to permanent native forest cover. However, this will need to be regulated, as described below.

There are significant risks associated with the inclusion of exotic species in the permanent forest category, which need to be managed. The risks are magnified on some sites. Radiata-pine is a 'pioneer species' and does not have a long lifespan. Senescent trees create hazardous conditions within the stands, unless carefully transitioned (for which there is currently a lack of research and established management practices). Also, standing dead wood increases fire risk, plus there is risk of windthrow and mobilisation of woody material and creation of debris bombs during extreme weather events. These risks will need to be managed. More research is required around specific risk areas and management practices, such as ensuring early transitioning of gullies to native forest while the majority of the pine stand is left to shelter the land and developing native understory.

The Ministerial Inquiry report identified the **urgent need to create policy and incentives to support desirable land-use change that will help heal the land;** however, it did not address how existing plantations and farmland in the 'purple zone' could be transitioned into permanent forest for catchment protection. **This will likely require government support**. The TTT Transitioning Exotic Forest to Native research along with the Maximising Forest Carbon programme will be able to guide transition pathways and management requirements.

TTT disagrees with the assertion quoted above, from the Ministerial Inquiry report, that *"… pre-1990 permanent forest (that is, not sequestering carbon) …"*. The evidence from our databases shows that many pre-1990 native forest will continue to sequester carbon for many decades, possibly hundreds of years, e.g., the regenerated tōtara resource in Northland (see APPENDIX 3). Just because it is

classified as pre-1990 permanent forest and is currently not recognised in the ETS, does not mean it is no longer sequestering carbon. TTT thinks that all native forest still sequestering carbon irrespective of its age should be eligible for the ETS.

Native forests have a vital role to play in risk management and climate resilience

Multi-age, multi-species forests are more likely to be resilient to the impacts of climate change than monocultures[15]. (This is relevant to Q.1 and the discussion on *Managing climate change related risks,* on page 27 of the discussion document).

TTT is currently finalising a **Resilient Forests factsheet**, as part of a factsheet series on forest establishment (planting and assisted natural regeneration) funded by Te Uru Rākau, which will soon be launched on TTT's website. This factsheet looks at the predicted changes for our climate and how this is likely to impact existing forest and the establishment of new native forest. It also considers measures required to make our native forest more resilient.

The role of forests in catchment protection is well documented. Strategically-established native forest provides climate resilience via soil stabilisation and catchment protection; green firebreaks reduce the risk of wildfire spread; trees provide shade, shelter, and trap moisture, ameliorating local climate in urban areas and farmland; and green infrastructure and coastal buffers protect urban and rural landscapes by moderating extreme weather events, including flood events and storm surges (Aimers et al 2021)[16].

Green fire-breaks, made up of a mix of low-flammability species, can be a good tool for helping slow or even stop the spread of wildfires.[17] These green firebreaks can also have co-benefits of providing ecological corridors and enhancing biodiversity values, particularly if native species are used.

The most effective measures for maintaining soil cover (and protecting catchments) are to retain existing forest and shrub cover, or encourage reforestation of erosion-prone areas and riparian zones[18,19]. There is a wealth of data showing that the area of soil eroded by storms is consistently less (in the range of 50% to 90% less) where native forest is retained, or marginal land is allowed to revert to native vegetation, or forest is planted – as compared with pastureland[20,21].

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[15] Aimers, J. (2021). Future-proofing our Ngahere. O Tātou Ngahere (Our Forest) - https://pureadvantage.org/future-proofing-our-ngahere/

[16] https://www.tanestrees.org.nz/site/assets/files/1099/non_timber_values_in_native_forests_-_web.pdf

[17] https://www.tanestrees.org.nz/site/assets/files/1321/green_fire-breaks-_june_2020-_ja.pdf

[18] MPI (2015). *Sustainable management of New Zealand's forests.* New Zealand's third country report on the Montreal process criteria and indicators: https://www.teururakau.govt.nz/te-uru-rakau-forestry-new-zealand/about-te-uru-rakau/our-work-and-partnerships/montreal-process/

[19] Gluckman, P. (2017). *New Zealand's fresh waters: Values, state, trends and human impacts.* Office of the PM's Chief Science Advisor. http://www.pmcsa.org.nz/wp-content/uploads/PMCSA-Freshwater-Report.pdf

[20] Blaschke, P., Hicks, D., & Meister, A. (2008). *Quantification of the flood and erosion reduction benefits, and costs, of climate change mitigation measures in New Zealand*. Blaschke and Rutherford Environmental Consultants for the Ministry for the Environment. Wellington. https://environment.govt.nz/publications/quantification-of-the-flood-and-erosion-reduction-benefits-and-costs-of-climate-change-mitigation-measures-in-new-zealand/

[21] Ausseil, A.G.E., Dymond, J.R., Kirschbaum, M.U.F., et al. (2013). Assessment of multiple ecosystem services in New Zealand at the catchment scale. *Environmental Modelling and Software,* 43: 37 – 48. http://dx.doi.org/10.1016/j.envsoft.2013.01.006

Collective research shows that **on highly erodible hill country soils, a better land use is permanent native forest cover,** rather than plantations grown on a clear-fell regime. Many parts of New Zealand, notably Tairawhiti, have highly erodible soils, and the erosion has been made much worse by historic destruction of the original forest cover and its replacement with grass. Added to this, there is the increasing frequency and severity of major storm events due to climate change. Also, attempts at amelioration of some of the erosion (by planting commercial forests) have themselves caused problems, particularly with the mobilization of forestry slash.

Clear-fell regimes of radiata-pine leave a vulnerable period of approximately 6 years, during which time there is an elevated risk of erosion and mobilisation of slash during high-intensity rain events on erodible steeplands.

However, even if permanent native forest was restored on all the erodible soils, it would not provide a complete solution. There would still be some slips and woody debris washed down in extreme weather events, as is evident in south Westland, which has original native forest in the hinterlands. But the risk and extent of this would be considerably lower.

A biodiversity credit system as an incentive for native forestation

TTT strongly supports the introduction of a biodiversity credit system as an incentive for native forest establishment and restoration, as recommended by the Ministerial Inquiry, and widely supported by stakeholders including industry representatives, as well as eNGOs.

This could be a tradable commodity that represents a return on investment from restoration of native forest, either via (i) afforestation, or (ii) additionality in existing native/exotic forest (e.g., via fencing and excluding browsers, pest animal and weed control, and enrichment planting) (see APPENDIX 5).

It would encourage (i) native afforestation by bridging the gap between native trees becoming established and increasing their growth rate to earn enough carbon credits to reward landowners; and (ii) good management of existing native forests, much of which is currently damaged by browsers, predators, and weeds - compromising ecosystem services including carbon storage[22].

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

[22] Hackwell & Robinson (2021). Protecting Our Natural Ecosystems' Carbon Sinks https://www.forestandbird.org.nz/resources/climate-change-and-introduced-browsers

Assessment Criteria - Government wants the redesigned permanent forest category to achieve multiple outcomes

Question 2: *Do you agree with our assessment criteria for the redesigned permanent forest category? If not, what would you change and why?*

TTT largely agrees with the assessment criteria listed on pages 14 to 15 of the discussion document. However, we would also add that there are important cultural values to be considered as well. Furthermore, the stated desire for the redesign to achieve multiple outcomes (page 14), could be reflected as a specific assessment criterion, or made more explicit, to avoid single-purpose outcomes (i.e., achieving only one of the criteria)

Not only does forestry management need to be environmentally sustainable - it also needs to be socially and culturally beneficial to contribute to sustainable development[23].

In most parts of New Zealand, Maori historically have had to adjust to the loss of large areas of native forest, culturally significant flora and fauna, traditional food sources, and traditional ways of life, which has negatively impacted on cultural values and well-being[23]. Environmental damage causes loss of cultural values such as access to natural resources, including traditional food gathering (mahinga kai), fibre for traditional weaving and wood for carving, Rongoa Maori medicinal plant resources and practices, and extinction of taonga species.

There are not only opportunities for local people gaining skills and employment through native forest restoration, but there are also opportunities for tangata whenua to regain stronger connections to the land they whakapapa to. There are already good examples of native forest restoration and conservation programmes that have been highly successful in not only environmental gains, but also creating positive outcomes for the well-being of local people and their communities, including well-being and community cohesiveness[23].

Question 3: *Do you think any of these criteria are more important than the others? If so, which criteria and why?*

TTT believe that the assessment criteria are all equally important, and that a holistic approach is needed rather than elevating one criteria over another. Forests should be multivalent. We would also add that there are important cultural values to be considered as well, as described above.

An appropriate overarching objective is *ka ora te whenua, ka ora te tangata – when the land is well, we are well.*

If there is a narrow focus on one criteria, there are risks of perverse outcomes, which needs to be considered by policymakers. This is where negative outcomes arise due to a narrow focus on single criteria without consideration of the broader context, i.e., a narrow focus on carbon sequestration can potentially create negative outcomes if protection and enhancement of other values such as biodiversity, and community values and human well-being are not considered.

[23] Aimers, J., Bergin, D., Horgan, G. (2021). Review of non-timber values in sustainably-managed native forest in New Zealand. Tāne's Tree Trust bulletin, Hamilton, New Zealand. 119 pages. https://www.tanestrees.org.nz/site/assets/files/1099/non_timber_values_in_native_forests_-_web.pdf

Design Choice 1: Which forests should be allowed in permanent forest category?

Question 4: *Of these options, what is your preferred approach? Why? Are there other options you prefer, that we haven't considered? (Note, options 1.2a and 1.2b are not mutually exclusive)*

Option 1.1: only transition forests and indigenous forests can enter the permanent forest category

Option 1.2: exotic forests allowed to enter under limited circumstances – for example, only certain types/ locations/ ownership characteristics of the exotic forest allowed. The following sub-options are not mutually exclusive:

- **Option 1.2a:** long-lived exotic species (such as redwoods)
- **Option 1.2b:** Maori-owned land
- **Option 1.2c:** small scale exotic forests planted on farms.

TTT trustees are not unanimous regarding the preferred option, but are **unanimous in wanting Government to create legislation that will preferentially favour and incentivise native forest within the permanent forest category.** TTT agrees with the statement on page 18 of the discussion document that "establishing wide-spread transition forests presents an unknown degree of risk." However, as stated previously, TTT supports transitioning directly from exotic to native forest, and avoiding clear-felling, on highly erodible steepland where the best option (and accepted consensus) is a managed transition back to native forest. This is a major driver for the transitional forestry project.

In regard to the options presented, the majority consensus is for Option 1.2a. We understand that under this option, permanent forest registration would be open to indigenous and transition forests on any land, and exotic species in limited circumstances. However, there was also support for Option 1.1. and Option 1.2c. In regard to the latter option, there was support for CCF regimes with exotics, such as John Wardle's Woodside Forest operation with radiata-pine (and the native black beech), near Oxford in Canterbury. That said, radiata pine is not the easiest species to work with in CCF regimes – there are other exotic (and native) species that are more amenable, according to the go-to handbook on continuous cover forestry in New Zealand, by retired TTT trustee, forester Ian Barton[24].

However, the view of TTT's Chairperson Peter Berg, a well recognised NZ forestry leader, resonates with many trustees – *"The only forest which has been permanent for the last 80-100 million years and is well proven is NZ's natural forest … I am uncomfortable with calling anything else permanent when it is clearly not. If Government wishes to promote other classes of forest for particular purposes it should name them accordingly – carbon forests, transition forests, continuous cover exotic forests are all names that might apply."*

TTT therefore requests that special recognition be given to native forests within the ETS.

Regarding the comment on top of page 17 of the discussion document – *"Although a novel forestry model, the Government recognised that transition forests, when managed appropriately, could play a role in establishing cost-effective indigenous carbon sinks"*. Development of cost-effective methods of native forest establishment is a major component of TTT's R&D programme (APPENDIX 1). TTT believes that there are lower risk methods for cost-effective establishment of native forest as described in APPENDIX 4.

Also, it is not a case that *"additional management may be required for transition forests to ensure they transition from exotic to indigenous species"*.

[24] Barton, I.L. (2008). Continuous cover forestry: A handbook for the management of New Zealand forests. Tāne's Tree Trust, Pukekohe. 104p. https://www.tanestrees.org.nz/site/assets/files/1069/continous_cover_forestry_-_web.pdf

Early results from the transitional forestry research project indicate that some transitional forests may require *significant* intervention and *all* transitional forests will require management of native seed sources and pest control at a similar level necessary for native forest to be successfully established (see APPENDIX 2).

In regard to mention of continuous cover forestry (CCF) regimes on Page 18, this is also possible with selected native species (see APPENDIX 6). The Totara Industry Project[25] demonstrated the viability of CCF with naturally regenerating farm-totara on marginal hill country.

Question 5: *If you support allowing exotic species under limited circumstances, how do you think your preferred 'limited circumstance' should be defined? (for example, if you support allowing long-lived exotics to register, how do you think we should define 'long-lived'?)*

There was not unanimous support among trustees for Option 1.2. However, there was a consensus that **exotic species with a high wilding risk should be excluded from the permanent forest category**.

Some trustees believe that the limited circumstances should be for long-lived species that have a low risk of wildings, and a relatively low fire risk, e.g., coastal redwood (*Sequoia sempervirens*). However, large, heavy trees such as redwoods need to be carefully sited, due to the risk of instability on shallow, erodible steepland soils. Most of TTT's trustees are also involved in other forestry organisations, and we are aware that Rob Webster has put in a good submission on behalf of the Sequoia Action Group of the NZ Farm Forestry Association.

A few TTT trustees would like to see more flexibility, i.e., inclusion of long-lived exotic forests in the permanent forest category, plus forests comprising various (and changing) mixes of exotic and native species, if managed as either transition forests (i.e., exotic to native), or as CCF forests (e.g., the Wardle's 'Woodside' forest, at Oxford, NZ).

However, **the consensus among TTT trustees is to recommend that special recognition be given to native forests within the permanent forest category of the ETS.**

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

[25] Totara Industry Project – see https://www.totaraindustry.co.nz/

Permanent forests could support environmental benefits and climate change adaptation and resilience (afforesting erosion-prone land)

Question 6: *Do you think there is an opportunity to use permanent forests to stabilise erosion-prone land?*

Yes, the Ministerial Inquiry report provides good evidence to support this, as does a wealth of research. However, care is needed on species choice. In this case, **Nature knows best**. The best type of forest for reforesting the erosion-prone steeplands of Tairawhiti is likely to be the original type of forest that stabilised the land for many thousands of years.

There is evidence to show that catchments clothed in native forest have shown greater stability in Tairawhiti during Cyclone Gabrielle[26]. This backs up earlier work. A study of land slipping was undertaken on the highly erodible, steep hill country on the East Coast of the North Island of New Zealand, in the aftermath of Cyclone Bola (Bergin et al. 1995[27]). The study compared pasture to areas reverting to native shrubland of different ages. Landslide damage showed a rapid and highly significant reduction against increasing age of reverting manuka/kanuka shrubland. Compared to pasture, there was a 65% reduction in shallow slipping of hillsides in reverting shrubland by age 10 years; and a 90% reduction by age 20 years.

Other studies indicate that radiata-pine forest provides similar protection from landslide damage as reverting native shrubland, within 10 years of establishment on steep hill country. However, clear-fell regimes of radiata-pine forestry leave a vulnerable period of approximately 6 years between the decaying of root systems of the logged crop and the new crop becoming established, during which time there is a risk of erosion in high-intensity rain events (Bergin et al. 1995[16]; Bloomberg et al. 2019[28]). Where the risk of losing further topsoil is high, it is preferable to keep the existing forest cover in place and manage it towards a mature native forest (i.e., transitional forest).

While multiple forestry organisations have advocated for redwoods to be included within the permanent forestry category, large, heavy trees such as redwoods need to be carefully sited, due to the risk of instability on shallow, erodible steepland soils. (A few of our trustees have experience with redwood species, and are active across multiple forestry organisations).

Permanent forests could help address the risk of wilding pines

Question 7: *Do you think the Government should consider restricting the permanent forest category to exotic species with a low wilding risk?*

Yes, TTT believes that the permanent forest category must exclude exotic species with a high wilding risk. Douglas-fir is a long-lived species with high rates of carbon sequestration, however, it is one of the top culprits for wildings and should be excluded because of this, unless sterile genetic lines are developed. 'Wilding pines' is a misnomer as one of the worst wilding species in New Zealand, Douglas-fir, is not in the pine family.

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[26] McMillan, Dymon, Jolly et al (2023). Rapid assessment of land damage - Cyclone Gabrielle. Contract Report: LC4292. Manaaki Whenua – Landcare Research

[27] Bergin, D.O., Kimberley, M.O., & Marden, M. (1995). Protective value of regenerating tea tree stands on erosion-prone hill country, East Coast, North Island, New Zealand. New Zealand Journal of Forestry Science, 25 (1), 3-19.

[28] Bloomberg, M., Cairns, E., Du, D., Palmer, H., & Perry, C. (2019). Alternatives to clear felling for harvesting of radiata pine plantations on erosion-susceptible land. NZ Journal of Forestry 64(3), 33–39.

Design Choice 2: How should transition forests be managed to ensure they transition and reduce the financial risks to participants?

Question 8: *Do you agree with the proposal for a specific carbon accounting method for transition forests? If you disagree, could you please provide the reasons why? If there are other options that you think we should consider, please list them.*

There may be no need for a new accounting methodology, but we are not sure. The existing stock change accounting method is probably the most appropriate method for transition forests. But there are a lot of unknowns about transitional forestry.

All forests, whether exotic, native, or mixed, need to be proactively managed. This includes ongoing monitoring and action taken where needed. With transitional forests, there are significant knowledge gaps about appropriate management practices, therefore, an adaptive management approach will be needed.

It is highly likely that those who have invested in this untested forestry land use will incur liabilities within the ETS, as large exotic trees are replaced by smaller indigenous species coming up under the canopy (as stated in Box 5 on page 22). We agree that this presents a financial risk to participants and may also act as a disincentive to plant transition forests. The financial incentives need to be adequate to ensure ongoing pest control is undertaken. Also, there is likely to be up-front costs associated with establishment of native seed islands, where there are no local seed sources.

In some circumstances, there may be no need to actively remove exotic trees if the native understory is diverse and slowly growing. The key activities for a successful transition to native forest is providing native seed sources and ensuring these seed-sources and the natural regenerating understory is not browsed. Different scenarios will occur with the native regeneration depending on environmental factors and forest succession trajectories [29] [30]. The most advantageous accounting system will enable and incentivise active and ongoing (perpetual) forest management inputs.

What empirical data is there to support Figure 1? There is very little information on transitional forestry as it is a novel forestry regime that did not exist in New Zealand prior to the establishment of the ETS, and there is a lack of publicly available data on the transitional forests that have been established due to commercial sensitivities. Therefore, Figure 1 must be largely speculative.

Question 9: *If you agree with the proposal for a specific carbon accounting method for transition forests, what do you think it needs to achieve?*

We are not sure that a new accounting methodology is needed for transitional forests. However, an accounting system that includes some averaging to allow for changes in carbon budgets may be useful. The transition from exotic dominated to native dominated canopy will be site specific. In benign climates, it is anticipated that the exotic trees will gradually senesce and light gaps with develop within the canopy (similar to what happens in a broadleaf/podocarp forest) or environmental events could determine the timing and how widespread the exotic canopy demise is, e.g., mass mortality as can happen within beech forest.

[29] Hall, G.M. and Hollinger D.Y. (2000). Simulating New Zealand forest dynamics with a generalised temperate forest gap model. Ecological Applications, 10(1) 115–130.
[30] Meurk C.D. and Hall G.M.J. (2006). Options for enhancing forest biodiversity across New Zealand's managed landscapes based on ecosystem modelling and spatial design. New Zealand Journal of Ecology (2006) 30(1): 131-146.

Question 10: *What do you think should occur if a forest does not transition from a predominately exotic to indigenous forest within 50 years?*

We consider it is highly unlikely to be able to affect a transition from exotic to native forest within 50 years. Many forests (exotic or regenerating native) will probably require 150 years or more to culminate in a mature native forest. It is likely to require intergenerational management activities. Is there any reason for the 50-year mark being chosen? Is it an arbitrary figure? Data is needed to justify if and when a penalty should be incurred.

Currently, regulations are such that there is little incentive for carbon farming investors to budget for (or invest in) the work required to manage a long-term transition. We are concerned that this practice is being exploited by some investors for short-term commercial gain, where they do not have a long-term vested interest in ensuring a legacy of permanent forest cover. This presents a significant social-license-to-practice problem, which undermines the ETS and New Zealand's efforts to combat climate change, and also the plantation forestry industry, due to growing anti-radiata-pine sentiment.

Regulations are urgently needed to ensure that transitional forestry investors budget for, and invest in, the work required to manage a transition to natives. This includes monitoring processes to ensure appropriate practices are being carried out to manage a transition to permanent native forest. Also, some sort of bond or requirement for a suitable insurance policy is needed up front, should there be failure to transition to native forest.

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

Design Choice 3: How should permanent forests be managed?

There are three main choices to make regarding the permanent forest category management:
a) what the new rules should be, and which forest types they apply to?
b) how flexible or prescriptive the new rules should be?
c) what should the compliance (monitoring and enforcement) regime look like?

Three options are being considered:
a. Option 3.1: status quo (no additional forest management requirements introduced for forests in the permanent forest category).
b. Option 3.2: New minimum forest management requirements – specific to the permanent forest category – are introduced for all registered permanent forests (exotic, indigenous and transition forests).
c. Option 3.3: New forest management requirements are needed for transition forests.

Question 11: *Of these options, what is your preferred approach? Why? Are there other options you prefer, that we haven't considered? (Note, options 3.2 and 3.3 are not mutually exclusive).*

Option 3.1 risks neglectful/inadequate forest management and encouraging 'plant and leave' forests. Option 3.2 would likely result in a suite of low-bar thresholds that fail to ensure good performance or best practice outcomes. In contrast, 3.3 would require professionally prepared and reviewed site-specific forest management plans. This would provide greatest flexibility for novel and site-specific/appropriate forest management, while retaining a sufficient control mechanism.

Some mechanism would be needed to ensure the Forest Management Plans are enacted, such as registering the Management Plans on the land title – as per the Indigenous Forest Management under Part 3A of the Forests Act).

TTT highly recommends that CCF regimes are permitted for planted forests or regenerating forest on private land, as demonstrated by the Totara Industry Project[31] (See APPENDIX 6). This project demonstrated the practical feasibility and potential business case for sustainable forest management, with naturally regenerating totara on marginal Northland hill country (as per Part 3A of the Forests Act). CCF involves limited careful harvest of high-value timber in 'near to nature' forestry regimes. Permanent forest cover is maintained, along with most of the high-forest ecosystem services, and there is a future revenue stream for landowners in addition to carbon.

In this regard, the strict requirements of Part 3A of the Forests Act would be sufficient regulation to meet the requirements of the permanent forest category. This is supported by the provisions for sustainable forest management under the Forests Act, included in the National Policy Statement for Indigenous Biodiversity.

The Government's Forestry and Wood Processing Industry Transformation Plan (ITP)[32] identified accelerating the uptake of CCF, in its various forms, as a priority under action 7.2.

Examples of successful CCF in NZ include:
- The Totara Industry Project in Northland – https://www.totaraindustry.co.nz/ https://www.tanestrees.org.nz/about-us/northland-totara-working-group-ntwg/
- Forever Beech in Westland – https://www.healthbasedbuilding.com/foreverbeech

[31] Totara Industry Project – see https://www.totaraindustry.co.nz/
[32] https://www.mpi.govt.nz/forestry/forest-industry-and-workforce/forestry-and-wood-processing-industry-transformation-plan/

- Woodside Forest in Canterbury – John Wardle's operation with radiata-pine and black beech, near Oxford - https://www.tanestrees.org.nz/site/assets/files/1067/newsletter_39.pdf https://pureadvantage.org/quantifying-multi-purpose-indigenous-forest-management-in-nz/

In regard to transitional forests, TTT recommends that there are specific rules to ensure they are advancing along the transition trajectory in a timely manner, though it is noted that it will likely take 100+ years to fully transition to natives. This will reduce the risk they become unmanaged plant-and-leave exotic forests. As mentioned above, there are many risks associated with this novel type of forestry regime. **However, TTT advise caution in forming fixed policy before results from large scale trials are available.** We understand that regulation is urgently needed, but it must have the proviso that policy will be amended as results of research on transitional forestry become available, i.e., an adaptive management approach.

Question 12: *If there were to be additional management requirements for transition forests, what do you think they should be for? Why?*

This is a difficult question to answer as transitional forestry is a novel and experimental forestry regime that did not exist prior to the establishment of the NZ ETS, and there is a lack of publicly available data on the transitional forests that have been established due to commercial sensitivities. At present there is minimal research and evidence-based management practices to guide and inform where and how transitions to native forest can achieved.

We are concerned that in some cases carbon forests are being inappropriately exploited for short-term commercial gain by parties who do not have a long-term vested interest in ensuring a legacy of permanent forest cover. There is a conflict between maximising income from carbon sequestration and effecting a transition to native forest.

To help mitigate the risks associated with non-harvest carbon forests, the following are needed:

- **Assessment and independent review of forest management plans**, registered on the land title, and;
- **Monitoring processes** to ensure appropriate practices are being carried out to manage a transition to permanent native forest with time-based vegetation tier/diversity goals; and
- **Some sort of bond or requirement for a suitable insurance policy,** should there be failure to transition to native forest.

Evidence needs to be provided to show that appropriate practices are in place to manage a transition to natives, over the long-term**.** However, TTT also acknowledges that there is currently a lack of established management practices for transitioning exotic plantations to native forest. This is why the transitional forestry research project is so important (see APPENDIX 2).

Early evidence from the project indicate that intervention will be needed to transition radiata-pine forest to permanent native forest, depending on local site characteristics, and with current knowledge, cannot be assured. Managing transitions from exotic forest to native is likely to be complex, subject to many variables, and very site and context dependent. Another concern is that disintegrating, senescent radiata-pine stands are dangerous to work in. The earlier transitional management practices are initiated, the better.

As yet, **there are many unknowns due to limited data and a lack of established management practices.** However, TTT recommends a management planning framework for transitional forests should layout intervention methods and milestones that are required to achieve a transition to

native forest, as well as requirements for monitoring and reporting. An adaptive management approach will likely be needed, with adjustments made as more information becomes available.

TTT is aware that the NZIF submission recommends that MPI establish a consultative working group to assist in creating a management planning framework for transitional forestry within the permanent forest category. (Over half of TTT trustees are members of NZIF, including past and present office holders in the NZIF Council). TTT recommends that members of the transitional forestry research project team are part of any consultive working group.

Question 13: *Do you think transition forests should be required to meet specific timebound milestones to demonstrate they are on a pathway to successful transition?*

Yes. However, these timebound milestones should be related to the site and the local characteristics. There will be no one-size-fits-all scenario due to site variables, previous land-use history, and local constraints (e.g., presence or absence of native seed sources and vectors). Milestones will need to be determined on a site-by-site basis and should be outcomes focused, based around the completion of measurable steps that are documented as required to achieve the transition objectives.

The management plan should be focused on the minimisation of risks associated with this experimental forestry land use, as described above (Q.12), registered on the land title, and with a monitoring system and some sort of bond or insurance policy.

Question 14: *Do you agree with this proposal to allow transition forests to be permitted to clear-fell small coupes or strips to establish indigenous species? Why? And if you agree, what other restrictions should there be?*

This is a difficult question to answer as currently there is insufficient research and evidence-based management practices to guide and inform where and how transitions to native forest can achieved. However, CCF practices that include small coupe felling, or strips, may be appropriate in some areas, but not all. Appropriateness will be site-specific and context dependent.

Such harvesting should not be a permitted right across all permanent forests, but it may be appropriate for transitioning production forests to native forests on highly erodible steeplands, such as is in Tairawhiti. Independent peer-reviewing of forest management plans would be appropriate. Opening up of the canopy (larger than a 3-5 trees mimicking natural gap development) could be detrimental to the overall forest transition as it may encourage the establishment of weeds, wind throw etc.

Design Choice 3b: How flexible or prescriptive should forest management requirements be?

Question 15: *If forest management requirements are implemented, do you think these should be prescriptive or outcomes focussed? Why/Why not?*

Forest management requirements need to be outcome focused so that the method of achieving the outcome is flexible. As mentioned above (Q.13), there will be no one-size-fits-all scenario due to site variables, previous land-use history, and local constraints (e.g., presence or absence of native seed sources and vectors). Management requirements should be determined on a site-by-site basis and

outcomes focused, based around the completion of measurable steps that are documented as required to achieve the transition objectives.

One way to implement forest management requirements could be via forest management plans

Question 16: *What are your views on forest management plans?*

Forest Management Plans would be a useful tool to ensure that values and risks are identified and appropriately considered for management. This would be needed for transitional and CCF forestry regimes. Directives to identify constraints, risks, and risk mitigation methods (as per NES PF management plans) should be mandatory, as well as necessary identifying methods for transition and staged transition goals that relate to vegetation structure development and diversity.

Question 17: *What should forest management plans include?*

We envisage that management plans for transitional forestry regimes would:

- identify constraints, risks, and risk mitigation methods,
- layout the necessary intervention methods and milestones to achieve a transition, and
- include a monitoring regime, and
- be registered on the land title, and
- be independently monitored/audited, and
- likely involve intergenerational time frames.

An adaptive management approach will be needed, because of all the unknowns in regard to this experimental and risky forestry land use.

As mentioned above, establishment of a consultative working group to assist with management practices is advised, informed by results from the transitional forestry research project (APPENDIX 2).

Question 18: *Who do you think should be allowed to verify forest management plans?*

Transition management plans would need to be undertaken by a Registered Forest Advisor. Te Uru Rakau is the suitable organisation to undertake the verification/auditing of plans and to provide independence. There is an urgent need for training to cover this, with verification of having completed specialty training. This would have to cover regeneration modes of native species, and identifying threats and mitigation methods (e.g., weed and pest control). This is also important for management of permanent native forests.

Again, establishment a consultative working group to is advised, to assist with stipulations for the verification process.

Question 19: *How often do you think forest management plans should be audited or re-verified?*

Minimum of 5 years and with good history a maximum of 10 years.

Question 20: *What do you think should happen if there are not enough people to verify forest management plans?*

There is an urgent need for training to cover this. Verifiers in signing off forest management plans for transitional forests would need to have some expertise in regeneration modes of native species, and management of risks and constraints (e.g., weed and pest control).

Design choice 3c: What should the compliance (monitoring and enforcement) regime look like?

Question 21: *Do you think the use of existing compliance tools are appropriate?*

We are not sure of the answer for this question.

Question 22: *Do you think there should be new or expanded compliance tools for permanent forests? Which ones and why?*

There would need to be serious consequences for significant failures and infringements, including deregistration, fines and surrendering or repayment of units (e.g., along the lines of the Box 9 example). Existing ETS compliance regulations and penalties, plus the modified NES-PF compliance regulations would probably cover this.

Question 23: *Are there other compliance options that you think we should consider?*

No

Question 24: *For the compliance tools you think we should have, when do you think they should be used?*

The fundamentals of the compliance action hierarchy as illustrated in Box 8 of the discussion document would likely suffice for general direction.

Ka ora te whenua, ka ora te tāngata – When the land is well, we are well

APPENDIX 1 - Tane's Tree Trust's Research & Development programme

TTT undertakes applied research to deliver practical science-based technical information. Projects are based around forest establishment (planting and assisted natural regeneration) through to supporting long-term sustainable management of permanent native forest.

A summary is provided below. More information is available in the TTT Annual Report[33].

Normalising Native Forestry (core research programme)

This is funded by The Tindall Foundation, with support leveraged from other funders. It includes six workstreams:

1. Working with nature to establish native forests at scale through planting and encouraging natural regeneration.
2. Promoting continuous-cover native forestry for sustainable harvesting.
3. Making the most of TTT's growth and reference databases.
4. Incentivising landowners by developing an economic case for native forestry and supporting incentive schemes.
5. Evaluating novel, transitional ecosystems – transitioning of exotic species to native forest.
6. Collaboratively building capability by working with others involved in, for example, pest animal, bird predator and selective weed control.

Other ongoing and recently completed work

- Native Forest Toolkit – calculators developed for: (i) planting and budgeting; (ii) productivity; (iii) carbon sequestration; and (iv) economics (returns and benefits). Largely funded by the Sustainable Farming Fund (SFF) and based on the Trust's Indigenous Plantation Database. These web-based tools are free to access via our website - https://toolkit.tanestrees.org.nz/
- Adaptive Management of Coastal Forestry Buffers, with the Coastal Restoration Trust. Preliminary guidelines are available for this recently completed SFF-funded project.
- Fact sheets on forest establishment (planting and assisted natural regeneration) funded by Te Uru Rākau. These will soon be freely available on our website.
- Re-measurement of farm-tōtara trials established by the Northland Tōtara Working Group.
- A practical guide to the management of tōtara on private land, co-funded by Te Uru Rākau.
- Videos and workshops on best practice restoration and management of native forests – a collaborative project, co-funded by the Department of Conservation.
- Demonstrating the establishment of seed islands to bring back natives and encourage natural regeneration in collaboration with Trees That Count; Waikereru Ecosanctuary, Tairāwhiti; Pāmu Farms; and other partners.
- Monitoring system for early survival and growth of plantings, in collaboration with Trees That Count, Tasman Environment Trust, Auckland Council and Pāmu Farms.
- Transitioning exotic forest to natives – a recently initiated 5-year project, largely funded by the Sustainable Food and Fibre Futures Fund (SFFF).
- Valuing ecosystem services – a recently initiated multi-agency collaboration with Pāmu Farms, largely funded by SFFF. This involves creating a web-based tool for landowners to use to assess ecosystem quality of degraded natural vegetation on farms, before and after intervention.
- Ongoing work on submissions and consultation with the Government, advocating for all aspects of native forestry, and incentives for landowners.

[33] Tane's Tree Trust Annual Report 2022 - https://www.tanestrees.org.nz/site/assets/files/1037/ttt_annual_report_2022.pdf

APPENDIX 2 - Early results from a 5-year project on Transitioning Exotic Forest to Natives

Late last year, TTT and collaborators started a **5-year research project** - **Transitioning exotic forest to natives**, which is largely funded by the Sustainable Food and Fibre Futures Fund (SFFF) with significant in-kind support from the plantation forestry industry.

An important driver for this research is the opportunity to transition directly from exotic to native forest, avoiding clear-felling on erodible land in regions such as Tairāwhiti where, with correct management, understory regeneration can be supported. The commercial plantation forestry industry is looking for advice on how to retire radiata-pine stands safely and cost-effectively on remote, erodible steeplands, which are not economical to harvest and/or pose environmental risks and where the best option is a managed transition back to native forest. This is highly pertinent to a requirement of the updated NZ FSC Standards.

Another positive driver is that many Maori landowners are currently actively seeking technical advice in transitioning radiata-pine forest back to native forest.

There is also significant concern about the use of radiata pine for permanent carbon forestry.

Radiata pine provides good slope stability, and the canopy initially shades out weed species and then opens up to allow native forest understory development[34]. However, publicly funded research and guidance on transitional forestry management practices has been lacking until recently.

PROJECT OBJECTIVE

This project will deliver a comprehensive and well-coordinated research programme on the topic of transitioning exotic forest to native forest, and freely disseminate the results, including management prescriptions/recommendations, to all stakeholders (e.g., landowners, forest owners, forest managers, policymakers, and regulators).

OUTCOMES

The outcomes of this project are:

- Analysis of existing data sets of native understory development and forest characteristics within existing plantation forests to better understand these forests and necessary management.
- Establishment of a nationally relevant network of permanent sample plots to inform carbon and forestry models and to empirically refine management practices.
- Modelling of the dynamics of transitional forest for a range of contexts and management objectives (e.g., growth, successional change, and carbon profiles).
- Guidelines for the effective management of transitioning exotic forest to native forest including thresholds and levels of effective intervention.
- Recommendations for best-practice transitional forestry.

WORKSTREAMS

The research project is in its early stages and workstreams are at various stages. The establishment of permanent forestry trials to collect data in existing older exotic stands has started with the first

[34] Eckehard, G.; Brockerhoff, E.G.; Ecroyd, C.E.; Leckie, A.C.; Kimberley, M.O. (2003). Diversity and succession of adventive and indigenous vascular understorey plants in *Pinus radiata* plantation forests in New Zealand. Forest Ecology and Management 185 (2003) 307–326

trial set up in Whangapoua Forest, Coromandel. Further trials are being planned and may include Tairawhiti, Nelson and Taranaki. Surveys of a range of sites representing a gradation of climate zones throughout New Zealand and under different pine canopy densities are halfway through.

RESULTS TO DATE

LUCAS plot data has been reviewed to provide an early indication of the status of regeneration in conventionally managed exotic plantations. Analysis reveals that the understory of young (< 35 years old) radiata-pine forests typically contains a diverse range of woody species which are overwhelmingly native rather than adventive. Most of these native species can be classified as subcanopy tree, shrub species or tree ferns with only a handful of canopy tree species appearing in older stands. Both the biodiversity and carbon stock in the understory tends to gradually increase with stand age. Lower stocked pine stands (<200 stems/ha) at 20+ years had significantly more understory carbon than 400+ stems/ha stands.

The LUCAS understory consists almost entirely of subcanopy tree species, shrubs, and tree ferns with an almost a complete absence of canopy tree species in the understory. This correlates with Smale and Kimberley (1993)[35] who found that the canopy species in Mount Pureora conifer/broadleaf forest were largely absent in the understory but established during the gap and building phases. However, it was noted that the Tairawhiti surveys to date often have native canopy species present in plots although in low numbers.

Examination of both the existing LUCAS data and data that will be collected from other workstreams will help identify situations where a transition is likely to be successful or unsuccessful and provide guidelines and recommendations regarding management.

Initial results from the Tairawhiti and South Island field surveys indicate that bioclimatic conditions can have a significant effect on existing native regeneration under pine forests (e.g., cold dry climates are not conducive to good native regeneration) and proximity to native seed sources and browser pressure are nationally common drives for native understory diversity. Native understory density is relatively low compared with native regeneration in the open (but potentially similar to some even-age, tall dark native forest where there are few canopy gaps) and is affected by introduced animal browse throughout much of the country. So far, no relationship has been found between native understory diversity and pine canopy density.

TEAM

We have a strong team of scientists and foresters within TTT plus two associates who have the most experience in New Zealand in exotics-to-native transitions (Dr Adam Forbes and Megan Graeme). We are well placed to provide unbiased scientific research.

Tane's Tree Trust and the Coastal Restoration Trust collaborated on a Sustainable Farming Fund research project exploring practical options to transition failing exotic duneland forest buffers to resilient permanent indigenous buffers. Indigenous coastal forest buffers will provide more sustainable and effective protection to the production forests landward, with application to other productive land uses on our coasts and in the face of expected impacts of climate change. This project was led by Megan Graeme and Dr David Bergin.

Ecologist and Registered Forestry Advisor Megan Graeme is the project leader for this current transitional forestry research project. Registered Forestry Advisors Michael Bergin and Paul Quinlan,

[35] Smale, M.C., Kimberley, M.O. (1993) Regeneration patterns in montane conifer/broadleaved forest on Mt Pureora, New Zealand. N. Z. Journal of Forestry Science, 23: 123-141.

forestry scientist Adam Forbes, and biometrician Mark Kimberley are key team members. Adam is a leading forest ecologist who completed a PhD on management of non-harvest pine stands and has published most of the research on this topic.

Reference:

Forbes, A., & Norton, D. (2021). Transitioning Exotic Plantations to Native Forest: A Report on the State of Knowledge. Contract report prepared by Forbes Ecology Limited for the Ministry of Primary Industries. https://www.mpi.govt.nz/dmsdocument/47521-Transitioning-Exotic-Plantations-to-Native-Forest-A-Report-on-the-State-of-Knowledge-2021-22-

APPENDIX 3 - Carbon sequestration in sustainably managed native forest

Research demonstrates that planted and managed indigenous forest is better at sequestering carbon and faster growing than commonly considered - https://pureadvantage.org/carbon-sequestration-by-native-forest-setting-the-record-straight/ A paper is currently being prepared for submission to an academic journal.

Analysis of Tāne's Tree Trust data from planted native trees still supports the position that radiata pine is initially faster growing and simpler to manage, but the difference between carbon sequestration in radiata pine and well managed planted native forest is much less than is often suggested.

Data from Tāne's Tree Trust Indigenous Plantation Database show that:

- carbon sequestration for planted forests of totara, kauri, kahikatea, rimu, other conifers, puriri, beech, and other broadleaves is in the range:
  - **10.0 to 16.4** tCO_2 ha^{-1} yr^{-1} (mean annual increment over 50 years) and
  - **18.2 to 29.9** tCO_2 ha^{-1} yr^{-1} (current annual increment at age 50 years)
- growth rates of these native tree species increase steadily over the first 50 years achieving higher productivity as well as carbon sequestration with age.

This research is a first for planted native forest using methodology comparable to that used for planted radiata pine forest in New Zealand (mean annual increment is 21 to 27 tCO_2 ha^{-1} yr^{-1} for radiata pine at age 50 years).

Investment in research and development would benefit native forestry as it has the radiata-pine industry, i.e., result in increased growth rates and more knowledge around forest management.

New Zealand's Carbon Look-up Tables for the Emission Trading Scheme should include the option for planted native forest as well as regenerating native forest. The current Look-up Tables for native forest are accurate when applied to naturally regenerating shrubland. However, to achieve good levels of sequestration over a long timeframe, regenerating forest needs to include climax tree species such as totara.

Properly sited and managed planted native tree species are a good alternative where landowners wish to sequester carbon over long time periods, as well as enhancing natural landscapes, indigenous biodiversity and cultural values.

APPENDIX 4 - Cost-effective methods for landscape-scale establishment of native forest

We propose assisted natural regeneration augmented by targeted planting:

- **We advise a shift in focus from reliance on mostly planted forests to assisted natural regeneration –** where planting is part of the mix, along with management to limit factors that inhibit natural regeneration of natives, i.e., control of the most aggressive weeds, elimination of pests including predators of bird populations essential for seed spread.
- We support direct planting, but recommend that it is deployed strategically (to complement leverage natural processes), starts on a modest scale, and expands as quickly as capacity permits.
- Concurrent with this is the need to monitor the success or otherwise of planting programmes so that management changes can be made early on to improve performance with subsequent plantings.
- Fixed annual targets should be used with caution, although we understand there is a need to reach carbon sequestration targets.
- Management of natural regeneration coupled with targeted planting must be well planned, adapted to the site, supervised, and the outcome monitored, and the management input sustained.
- Start with a survey to identify potential sites for natural regeneration.
- Identify any existing native forest within bird range that will encourage the spread of seeds of key native tree species.
- Our birds have a good track record, having established forests in Aotearoa for millions of years. Strategic planting of berry-producing shrub species provides an incentive for birds to visit sites. Implement control of bird and seed predators such as rodents, mustelids, and possums – to protect and boost natural regenerative processes.
- There will likely be a need for enrichment planting of species no longer locally present. In addition to native forest species that are bird dispersed, this will include species with wind-dispersed seed.
- Let the birds and the wind be our natural drones in spreading seed across vast landscapes of marginal pastoral steep hill country that are a priority for native afforestation. Where there are no native forests within bird range, we can prepare a seed source for them by employing a strategy that has been developed and is being evaluated by TTT, i.e., establishing a network of seed islands comprising a diverse range of bird- and wind-dispersed seeding species.
- TTT has produced fact sheets on assisted natural regeneration and the seed island approach. These will soon be published on our website.
- Assisted natural regeneration could be done at a large scale as resources permit, and there should be no need for delay in getting this underway.
- Monitoring systems are vital as practitioners can act promptly to protect their ngahere, and also learn what does, and doesn't work, and adapt accordingly. This is particularly important in an era of climate change.
- This need not be delayed. Some of the human and financial resources available for direct planting should be diverted towards establishing a framework that supports natural regeneration – including sustainable management of the large area of existing natural regeneration, some of which is being routinely sprayed, cut back or burnt to keep marginal farmland in pasture.

Much of this is described in more detail in an article by Dr David Bergin – *The ten golden rules for establishing native forest at scale*, published as part of the O Tatou Ngāhere campaign https://pureadvantage.org/ten-golden-rules-for-large-scale-establishment-of-native-forest/.

Pros and cons of assisted natural regeneration

Advantages

- Scale - significant areas already exist (hundreds of thousands of hectares), that are in the process of regeneration to forest cover, and much more could be encouraged to regenerate.
- Low cost. Nature and time, assisted by the wind and birds, do the greatest share of the work.
- Less pressure. There are no fixed annual targets to be met.
- Flexibility. It is suited to a range of sites, large and small; and a range of different scenarios can be employed. There is scope here for site-specific and creative solutions.
- Plants that germinate naturally have been, by definition, ecosourced, and are therefore adapted to the site.
- Planting can be leveraged for maximum cost/benefit.
- Lower risk of dramatic failure.

Disadvantages

- Forest establishment will take longer. On the other hand, as it is low cost, it can start sooner and at a larger scale (and is already happening over large areas).
- We cannot assume that available open space will be colonised by native species alone. Over time we have introduced too many impediments for that to occur.
- We have introduced a range of weeds, some of which will be better adapted to the changing conditions of a warming climate – these can preclude natural regeneration on some sites, if there is no intervention. And then there are the introduced pests that must be controlled.
- Our remaining forests have been degraded and fragmented, and natural pathways for colonisation have been intercepted by cities, farms, and roads.
- Natural regeneration will need our assistance - weed and pest control is vital.
- All forests require ongoing and active management. There is presently insufficient financial incentive or income potential to encourage and support native forest management on private land – especially regarding regenerating native forest cover.

In summary – working with Nature for landscape-scale establishment

Successful large-scale establishment of native forest will depend on working with nature and integration with supportive economic drivers (i.e., investment, markets, industries, and incentives).

Encouraging natural regeneration should be done in tandem with pest animal control to prevent damage to the naturally established seedlings, working with Predator Free NZ, neighbouring landowners, iwi and local communities to boost bird populations and seed production for diverse forest ecosystems, selective weed control to remove or reduce the most aggressive and persistent exotic species, and undertaking strategic supplementary planting to bring back once abundant species now locally extinct or scarce.

Our recommendations:

- Enable naturally regenerated native cover that predates 1990, but that still has significant potential to sequester more carbon, to be eligible for financial returns from carbon through the ETS.
- For afforestation by planting alone, start with modest targets and build infrastructure, capability and confidence, and ‘iron out problems’, i.e., start with a smaller yearly target, upscaling gradually as capacity and competence improve.

- Look at the easiest options first - ‘nature-based solutions’ - assisted regeneration, building on the natural regeneration that is already happening in many hill country sites.
- Establishing seed islands amongst shrub pioneers, to help the natural succession to high-forest – let the birds do the work of spreading the seed.
- Ensure that nursery plant quality standards and infrastructure are in place to deliver quality, fit-for-purpose planting stock.
- Monitoring systems are vital and need to be a requirement of any funding for afforestation.
- Planters – are there sufficient well-trained planting gangs who know how to plant native species (as opposed to radiata-pine, which is quite different to plant)?

APPENDIX 5 - Additionality – the low-hanging fruit in carbon sequestration

"In the context of carbon markets, additionality generally means that an emissions reduction or removal traded should be above and beyond what would happen under current policy and business-as-usual conditions." **(Additionality, as defined on page 63 of the draft ERP2, from the Climate Change Commission).**

The following photos graphically demonstrate additionality, the 'low hanging fruit' for carbon sequestration. The photos demonstrate how slowly dying native forest stands on farms throughout NZ can be retrieved through intervention. Fencing, pest animal and weed control can quickly result in a flip from carbon loss to carbon gain[36], plus a myriad of other ecosystem services.

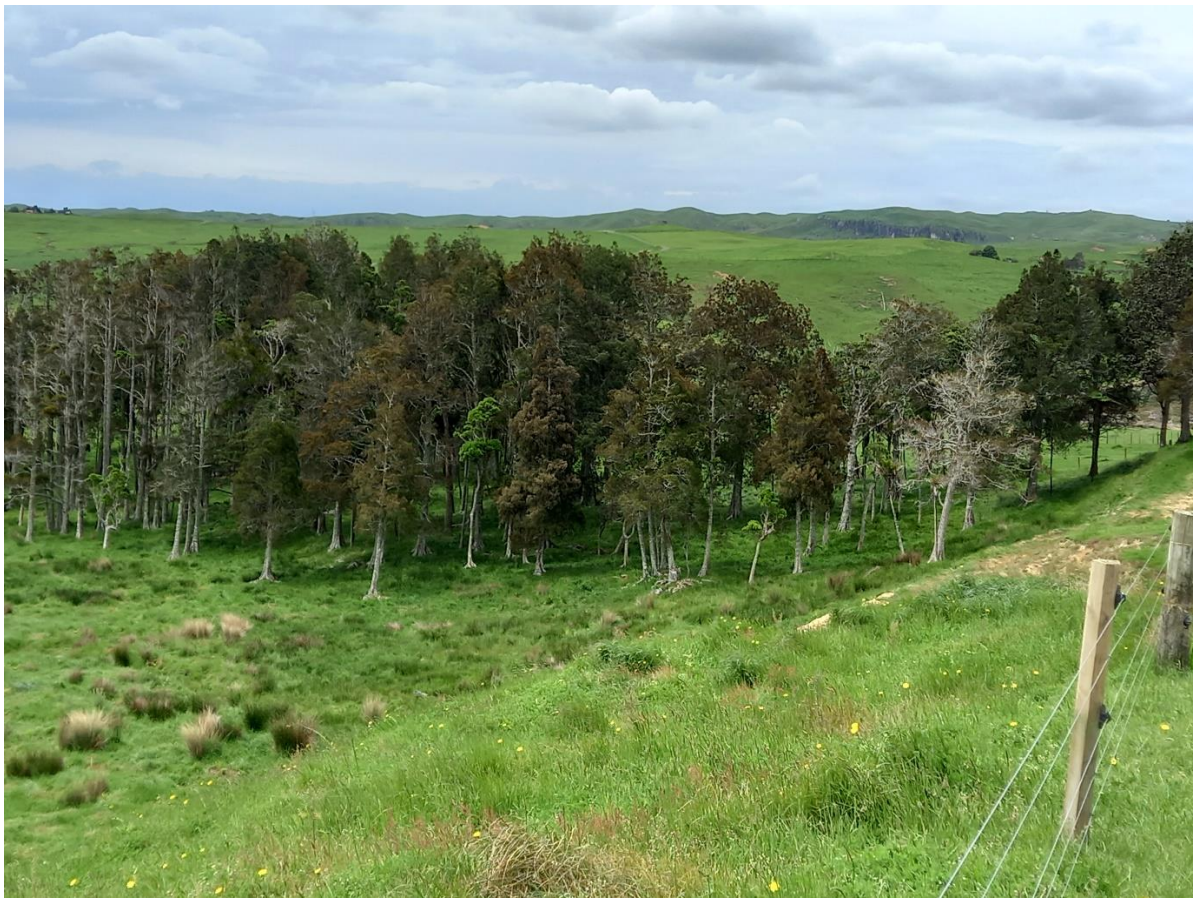


PHOTO 1: Degenerating kahikatea stand, north-west Waikato, which is fast losing carbon due to trees dying as a result of damage by livestock. These types of stands are typical throughout rural New Zealand.

[36] Hackwell & Robinson (2021). Protecting Our Natural Ecosystems' Carbon Sinks https://www.forestandbird.org.nz/resources/climate-change-and-introduced-browsers

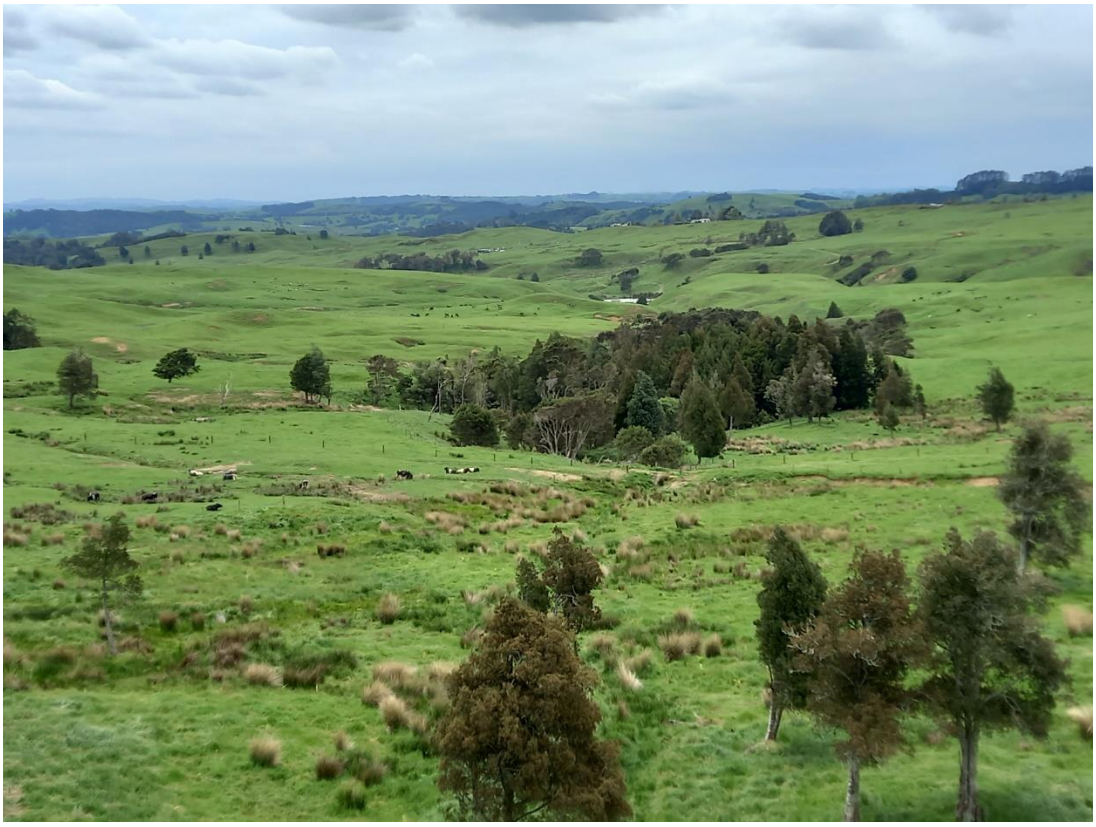
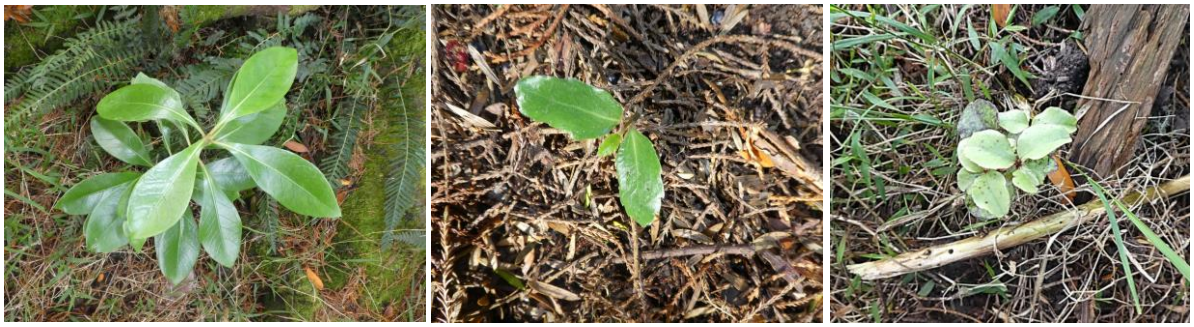


PHOTO 2: In the middle distance is a young, healthy, fast-growing stand of kahikatea, which is fenced. This stand is in the Waikato, close to the stand shown in PHOTO 1, but across a property boundary. A healthy stand like this will continue to sequester carbon for hundreds of years, and provide other ecosystem services such as protecting and maintaining water quality and biodiversity values (terrestrial and aquatic), flood protection, and shade and wind-breaks for livestock.

Note that in PHOTO 2 there are isolated trees outside the fenceline. These trees would once have been contiguous with the (now fenced) stand but have become outliers, as the edge trees are particularly vulnerable to damage from livestock. This shows how unfenced stands become fragmented, deteriorate and shrink over time. Fencing and stock exclusion arrest this process.

With fencing and pest control, native forest can quickly recover, particularly if there are nearby seed sources. PHOTOS 3a, b, & c (below) show young native seedlings in a recently fenced QEII stand on a Pamu farm, in the Far North. Edge trees were showing signs of recovery from livestock damage.



PHOTOs 3a, 3b & 3c: A selection of some of the native tree seedlings that were present 6 months after fencing a mixed podocarp forest. These seedlings were all found within a few metres.

PHOTO 4 (below) taken in a forest stand close by, provides a timeline comparison. This stand of native forest was fenced 4 years earlier on the same Pamu Farm. The edge trees have recovered from livestock damage. The farm manager has a good pest control programme and nearby forest on DoC land provides plentiful seed sources. Fruit-feeding native birds have deposited seeds and aided forest regeneration.

TTT is currently searching for data on carbon sequestration via 'additionality' in our databases and seeking data from other organisations.

PHOTO 4: Interior of a mixed podocarp forest, dominated by kahikatea (our tallest native tree). The stand was fenced 4 years ago and now has well developed understories compromising of a rich diversity of plant species, providing habitat for indigenous wildlife, including at-risk species such as a giant kauri snail species.

APPENDIX 6 - Creating industry around sustainable production of native timbers

New Zealand currently imports large amounts of specialty timbers each year - e.g., NZ$99.6 million worth in 2016 and NZ$107 million worth in 2017 (MPI 2021[37]). Some of this is from non-sustainable sources, e.g., kwila. There are multiple published discussions on why we are not producing more of our own specialty timbers, including timber from native species, e.g., sustainably grown tōtara would be an excellent substitute for imported western red cedar in many applications, as well as being a culturally important resource highly valued by Maori.

New Zealand is fortunate in having a spectacular range of world-class native timbers. They are part of our heritage, and we should have an opportunity to make use of them for decorative and practical purposes. By applying the principles of continuous cover forestry (CCF), selected trees can be harvested without compromising the integrity of the forest and the myriad of ecosystem services it provides[38].

A good example is the management of totara, which has proliferated in most regions due to clearance of the original forest cover and is recolonising on our less productive land. This is occurring even in the presence of grazing, despite repeated attempts by landowners to control it. Our Northland Totara Working Group (NTWG) is continuing to demonstrate that farmers have a valuable resource of native timber establishing before their eyes.

The NTWG has established over 60 Permanent Sample Plots in Northland demonstrating the benefits of thinning and pruning this resource as a future high-value specialty species that can be managed under CCF harvesting methods to retain high forest values and benefits. The Totara Industry Project[39] demonstrated the viability of CCF with naturally regenerating totara on marginal hill country. However, a viable native timber industry is required to encourage sustainable native forestry. Government investment could help expedite this.

Native forests require ongoing management and that requires ongoing income streams. These could come from carbon, timber, and payments for ecosystem services. However, effective mechanisms, industries and incentives need to be created to support this.

[37] Ministry for Primary Industries (MPI) (2021a). Wood product markets. Data on forestry imports and exports and indicative log prices: https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/forestry/wood-product-markets/

[38] See (https://www.tanestrees.org.nz/site/assets/files/1069/continous_cover_forestry_web.pdf; and https://pureadvantage.org/nature-based-forestry-regenerative-forestry-models-for-aotearoa/)

[39] Totara Industry Project – see https://www.totaraindustry.co.nz/