# Investing in natural capital – weaving native forest back through New Zealand's landscapes

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## Abstract

Prior to human arrival, New Zealand was almost entirely forested below the treeline. The current forested area represents over a 70% reduction from the pre-human state circa 800 years ago. This large-scale deforestation has been disastrous for our soils, water quality and biodiversity. However, there is now increased awareness of the importance (and vulnerability) of New Zealand's natural capital, and ecosystem services have become important in planning and policy matters.

Our native forests provide a myriad of environmental and cultural services, plus (potentially) timber and non-timber products. Unfortunately, we are often not fully aware of many of these ecosystem services until they are damaged or destroyed. There has been an imbalance in land-use decision-making between those who benefit from short-term economic gains and those suffering the long-term impacts from deforestation. The risk of environmental damage needs to be factored into land-use decisions and economic equations.

Unfortunately, the native forest historically destroyed in the highly erodible steeplands of the North Island's east coast was once regarded as worthless by many. In hindsight, it would likely have contributed billions of dollars in ecosystem services, including land stabilisation and protection of downstream communities, infrastructures, local economies, food production and natural ecosystems. Further, it would have reduced the loss and trauma experienced by thousands of people impacted by recent extreme weather events.

We must urgently develop models to incentivise native afforestation, and the protection and management of existing native forest – and reward landowners for the provision of ecosystem services for the benefit of all. But how do we value and incentivise these vital ecosystem services?


## Importance of natural capital and ecosystem services

Natural capital is defined as the stock of natural resources needed to support life and human activity (Costanza et al., 1997; Tax Working Group, 2019). Ecosystem services are the benefits that people obtain from ecosystems and are the components of natural capital (Millennium Ecosystem Assessment, 2005). In the forestry context, this includes the production of wood and fibre, as well as non-timber values.

Figure 1: Unique native species such as the silver fern are important to our national identity

The protection of natural capital is essential for the flow of ecosystem services. Quantifying ecosystems services allows the wider values of forests to be accounted for in economic analyses and land-use decision-making. In this context, the concept of value goes beyond traditional economics – it pertains to any benefit or service, including those that cannot be readily given a monetary value (Aimers et al., 2021). Just because a particular value cannot be easily quantified in monetary terms, it is not automatically inferior. There is the conundrum of 'valuing the invaluable' (i.e. ecosystems services without direct material benefits, but nonetheless vitally important).

According to the Tax Working Group (2019), the well-being of New Zealanders is critically dependent on the state of our natural environment and the health of our ecosystems, and we need to 'acknowledge natural capital as a profound and non-substitutable basis for the economy.' Also, 'natural capital is productive in its own right; even "unused" or "vacant" land, for example, produces a stream of ecosystem services that underpin human existence.'

Indeed, economic progress should not be defined solely by GDP growth; it should also consider the multiple values of nature for a good quality of life, while not exceeding biophysical and social limits (Pörtner et al., 2021). In 2017, an environmental performance report for New Zealand released by the OECD found that New Zealand's growth model, based largely on exploiting natural resources, was approaching its environmental limits mostly due to intensification of land use (OECD, 2017).

The ecosystem services concept has been criticised for being too human-centric (e.g. Schröter et al., 2014). A different perspective can be gained via Te Ao Māori principles. The principle of whakapapa (genealogical lines) implies a deep connection to the land and environment, with all living things sharing genealogical descent. Engagement with living things is likened to visiting kin (Walker et al., 2019). People care for ecosystems (manaaki whenua) and ecosystems care for people (manaaki tāngata). This viewpoint puts humans as part of the environment. Humans belong to the land, rather than the land (and all the associated natural capital) belonging to humans.

This holistic viewpoint is beautifully encapsulated by the Māori proverb, '*Ka ora te whenua, ka ora te tāngata – When the land is well, we are well.*'

Before humans arrived, New Zealand was heavily forested. Our native forest stabilised soils, maintained clean waterways, harboured biodiversity, provided food, resources and medicine, stored carbon, and helped form our unique landscapes and identity. After human settlement, there was a 70% loss in the original forest cover, with deforestation worse in our lowlands. This deforestation resulted in a huge loss of ecosystem services, which we are only now beginning to fully understand (Figures 1 and 2).

A Tāne's Tree Trust (TTT) review synthesised relevant literature on non-timber values (NTVs) in our native forests, with a focus on forests 'outside' of the conservation estate (Aimers et al., 2021). NTVs cover all elements of the ecosystem services concept other than wood and fibre products. All statements in this current paper are fully referenced in the much longer work. NTVs were identified and described under the three main categories below:

- Non-timber forest products (NTFPs) and other provisioning services
- Environmental regulating services
- Socioeconomic, cultural and spiritual services.

Also, supporting services were acknowledged as an important underlying component of all NTVs (i.e. the biophysical and chemical functions associated with the nutrient and water cycles, photosynthesis and soil formation) (Costanza et al., 1997; Millennium Ecosystem Assessment, 2005).

The research by Aimers et al. (2021) indicated that:

- Biodiversity is pivotal (i.e. efforts to increase biodiversity values will likely concurrently increase most other NTVs)
- Native forest in riparian areas is likely to have the highest aggregated NTVs
- Aggregated NTVs of native forests are likely to be greater than for exotic plantations, particularly concerning scenic, cultural and spiritual values, biodiversity, water quality and the protection of erodible steeplands, downstream infrastructures and ecosystems.

## Vulnerability of our steeplands

Intense weather events in the last five years have highlighted the vulnerability of our highly erodible steeplands. The most effective measures for maintaining soil cover (and protecting catchments) is to retain existing forest and shrub cover, or encourage reforestation of erosion-prone areas and riparian zones (MPI, 2015; Gluckman, 2017). 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 (Blaschke et al., 2008; Ausseil et al., 2013; McMillan et al., 2023).

Many parts of New Zealand, notably Tairawhiti, have highly erodible soils and the erosion has been made much worse by loss of native 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. Attempts at amelioration of some of the erosion (by planting commercial forests) have themselves caused problems, particularly with the mobilisation of forestry slash.

A recent report on land damage after Cyclone Gabrielle estimated the total mass of landslides at 300 million tonnes, with an economic cost of approximately $1.5 billion – conservatively estimated at $5 per tonne of eroded soil (McMillan et al., 2023). Regional soil erosion models showed that reduction in landslide probability was particularly evident where there was native forest. The report highlights the urgent need to transition our highly erodible land back into permanent forest cover.

## Integrating native forest back into lowlands

As well as re-cloaking our erodible steeplands, we also need to integrate more native forest back through our lowlands – enhancing existing productive land uses, rather than competing with them. This is where native forest is now particularly scarce, and where the greatest gains will be in biodiversity values, cultural values and carbon sequestration (Aimers et al., 2021).

In an era of climate change and biodiversity loss, we need forestry regimes for climate resilience managed primarily for the public good. Native forest provides (Aimers et al., 2021):

- Climate resilience via soil stabilisation and catchment protection
- Green firebreaks that reduce risk of wildfire spread
- Trees that provide shade, shelter and trap moisture, ameliorating local climate change
- Green infrastructure and coastal buffers that protect urban and rural landscapes by moderating extreme weather events, including flood events and storm surges.

## Can we have our cake and eat it too?

Is it possible to harvest timber and retain high-forest NTVs? Sustainable timber production in secondary native forests on private land is possible via continuous cover forestry (CCF) regimes (Bergin & Gea, 2007; Barton, 2008, Quinlan, 2022). High-value native timbers can be obtained for some native tree species managed under Sustainable Forest Management (SFM) Plans, and Permit (SFMP) provisions in Part IIIA of the Forest Act. Single trees or small groups of trees are carefully removed without compromising the integrity of the forest and the ecosystem services it provides.

A handbook on CCF is available on the TTT website (Barton, 2008). CCF has been demonstrated by the Northland Tōtara Working Group (NTWG) (Quinlan et al., 2011; Steward & Quinlan, 2019) and the management of native beech forest in Westland (Forever Beech) and Canterbury (Woodside Forest, Oxford, Canterbury) (Figure 3). The Tōtara Industry Pilot project has demonstrated the viability of CCF with naturally regenerating totara on marginal hill country (Dunningham et al., 2020).

## How can we incentivise native forestation?

In its advice to the Government, the Climate Change Commission (CCC) recommended the establishment of nearly 300,000 ha of new native forests before 2035, to help meet New Zealand's international climate change commitments, develop long-term carbon sinks, and improve biodiversity values and climate resilience (CCC, 2021).

The models to incentivise native afforestation and reward landholders urgently need to be developed. Most of the benefits resulting from the establishment and management of native forest accrue to the wider community, particularly to downstream communities, businesses and ecosystems, and not to the landholders themselves. Currently, the only ecosystem services from native forests that can be readily monetarised are timber (under very tight government regulation), carbon sequestration and honey production. There is an urgent need for financial incentives to bridge the gap between native trees becoming established and increasing their growth rate sufficient to earn enough carbon credits to reward landholders.

TTT are currently working with the Ministry for Primary Industries (MPI) to provide data for Look-up Tables for planted native forests, to complement the

Figure 2: Many of our unique native species, such as this Northland green gecko, are under threat (permitted handler)

current Look-up Table for natives, which is based on naturally regenerating kānuka/mānuka shrubland.

In July 2023, the Government released for public consultation a discussion document on biodiversity credit systems (BCS). A BCS would recognise in a consistent way projects and activities that protect or enhance indigenous biodiversity, and encourage investment to support landholders with protecting, maintaining and restoring indigenous biodiversity (Figure 4). However, under the new Government it is unclear if and how this would be progressed.

It is also imperative that we find cost-effective ways to weave more native forest back onto private land. Assisted natural regeneration (i.e. working with nature) will likely be the most cost-effective option for landscape-scale native forest establishment on our marginal eroding hill country, with complementary planting where needed (e.g. seed islands and enrichment planting) (Bergin, 2021).

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Figure 3: Farm-totara in Northland, 14 months after harvest (the light gaps created in this CCF regime have released other species)


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Figure 4: This restored riparian forest was once a rubbish dump at Awahou Stream, Rotorua. This restoration work is a tribute to the late Sue and Jaap van Dorsser, and their friends

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