Whakatū Forest Futures –

nurturing the 10,000+ hectares for their many values

Report from the Nelson City Council Right Tree Right Place Task Force

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Executive summary

The Right Tree Right Place Task Force was established by Nelson City Council (NCC) following several years of debate about the value of the 600+ ha of its commercial forests. Numerous reports on future management and potential to transition to forests other than of *Pinus radiata* had been commissioned over many years, but there has been limited action on the recommendations.

Whakatū Nelson is a village city set against a forested landscape, much of which drains through the city and suburbs. This backdrop of 10,000+ ha of forested, water and conservation reserves (embracing a 700 ha sanctuary) is a very valuable community asset particularly in the face of a rapidly changing, and increasingly challenging, climate.

No other New Zealand city has such a large forest area so close to its heart. In this context, the Task Force realised that decisions about future management of 600+ ha of largely *P. radiata* commercial forests needed to be through a 'lens' of seeing them as a small part of a much larger, 10,000+ ha forest with diverse values.

The relevance of this 'whole forests' view is that any plans to transition *P. radiata* to other types of trees must take into account the importance of maintaining and enhancing the biodiversity and resilience of the entire forest estate. To do otherwise may result in significant biodiversity loss in the entire 10,000+ ha while transitioning a few hundred hectares.

The Task Force review is thus a complex systems study involving physical, ecological, economic, social, temporal, and political elements. The study traverses a number of long-term strategic matters through to the physical, ecological, social, and fiscal realities of here-and-now commercial forestry and the options for transitioning to other forest types. This review also outlines the process undertaken by the Task Force to address a recognised need for system-level change in the management of and objectives for NCC's forest lands.

Recommendations of the Task Force are supported by four system reviews addressing key issues and frameworks for decision making, as well as four catchment-scale overviews (with transition options) for commercial forests in the Maitai, Brook, Marsden, and Roding catchments.

Recommendations take into account that making successful transitions (i.e. moving from *P. radiata* to other forest types to meet wider values) necessitates managing NCC's entire forest lands as a single entity. The current organisation and management of NCC's forest lands, for historical and other reasons, spreads responsibilities across multiple groups, thus dispersing and hindering a strategic focus on this major asset.

Recommendations therefore cover matters relating to:

- strategic governance and leadership
- transition of all commercial forested lands
- potential sources of finance to fund transitions

- strategic and management needs of commercial forest lands during the transition period
- catchment-specific options and issues
- recommendations to the CEO for urgent action, to address immediate ecological and economic risks associated with current transitions.

The most significant of these urgent actions were firstly, that until NCC has a plan, process and resources in place to transition existing and future (cutover) vacant land, that PF Olsen Ltd be directed to halt all harvesting in the Marsden Block (Douglas fir and *P. radiata*), to be effective immediately. Secondly, that harvesting be halted in all other areas until Task Force recommendations are received by NCC.

The purpose of these urgent recommendations was to halt the increase in the area of bare land (that would require transition investment), given that over 100 ha was already vacant and with much of it subject to the pre-1990 liabilities related to the requirement to be re-planted within 4 years of harvest.

Recommendations

The Task Force has 19 recommendations. The eight strategic, governance, leadership, and operational recommendations that the Task Force considers crucial for the opportunities inherent in the entire 10,000+ ha forest lands, including current commercial forests, to be fully realised are:

1. All Nelson City Council forested lands (the 10,000+ hectares) should be managed as a single, multi-purpose forest system that encompasses all conservation, water, and landscape reserves.
2. Nelson City Council should create a senior-level, forest systems leadership role, reporting directly to the Chief Executive, with accountability for ensuring strategic oversight, integration and coordination of all Nelson City Council forest management – including restoration, weed and pest control, investment and transition operations.
3. Nelson City Council should develop a long-term strategic plan for all its forested lands that is designed to achieve the desired values and opportunities while mitigating major risks – weeds, pests and particularly climate change.
4. Future governance and management of Nelson City Council's forest lands should include an independent community entity to maintain tangata whenua and intergenerational input, plus facilitate private and public investment in all future forest management.
5. Given the high numbers of invasive weeds and pests in the entire forest estate and the potential (and actual) biodiversity loss in indigenous forests, there is an urgent need to acknowledge this degradation and to develop and implement strategic, landscape-based approaches to biodiversity enhancement.
6. All current commercial forests should be transitioned into continuous-canopy forest systems, mostly of mixed species, that best meet community values and address climate risks.
7. To improve transition's affordability, Nelson City Council should undertake an independent costs and benefit analysis to identify opportunities to raise revenue via:

a. the sale of identified cutting rights to select stands for one rotation, inclusive of conditions relating to: ongoing public access, forest management, harvesting, time frames and hand-back

b. optimising New Zealand Emissions Trading Scheme (ETS) benefits from eligible stands

c. using local government powers to raise loans or levies through facilities specifically supporting nature-based investments.

8. All forest returns (and carbon credits) earned since the forests were reregistered into the New Zealand Emissions Trading Scheme should be 'ring-fenced' in Nelson City Council accounts, to help fund forest transitions and restoration.

Recommendations for transitions of current commercial forest stands have focused on those already harvested (are bare or grassed), urban water catchment and intake areas and terrain at risk of severe gully erosion. These total over 100 hectares. Three scenarios for transitions of all stands have included alternative timber species, (exotic or indigenous), mixed exotic and indigenous community forests, or indigenous only forests.

These scenarios are not intended to be prescriptive but a contribution to the detailed, site-specific planning needed for all areas to be transitioned.

Task Force members:

Morgan Williams (Chair), Joanne Clapcott, Stuart Orme, Matthew Benge, Andrew Fenemor, Rachel Sanson

Supported by:

John Hutton, Mark Macfarlane

Background – the heart of the challenge

The current forest landscape of Aotearoa New Zealand has been shaped by a massive loss of indigenous forests over the last 200 years, followed by a transition to softwood production forests and a focus on protecting and conserving remaining indigenous forests. The end result is a very binary forest landscape today.

The way people are interacting with the natural environment and forested landscapes is changing over time. In Whakatū Nelson, this evolving ecology is influenced by the availability and sustainability of natural resources, peoples' preference for scenes dominated by natural elements, and the health benefits and well-being associated with engaging with nature.

A focus on biodiversity has increased over recent decades through habitat protection, pest control and protected areas, including fenced sanctuaries. There has also been a widespread focus on indigenous planting of riparian areas in lowland habitats – to enhance protection of waters and forest remnants, as evidenced by the activities of the QEII National Trust, the signing of the Clean Streams Accord and the Jobs for Nature programme. However, these plantings have been dominated by vast numbers of small area plantings, often using low-stature species such as flaxes, grasses and shrubs.

Meanwhile, the economic returns on softwood forests, and specifically *Pinus radiata* forests, have varied according to terrain and distance from market. In recent years, an appreciation of the wider values of some of these forest lands (if they were in

more diverse forests) and the risks of monocultures, has led to calls for transitions away from pine forests, as in Whakatū Nelson.

Transitioning large-scale pine forest areas to alternate forest systems is a relatively new endeavour in New Zealand. Transition goals largely focus on a desire to protect and enhance indigenous biodiversity, resulting in practices that include: enhancing indigenous regeneration from within pine forest or through nurse species such as mānuka, kānuka, and even gorse, or active planting of indigenous species.

To date, indigenous species planting models appear to have had limited focus on establishing the tall-canopy species at the outset of the regeneration process. Further, forest canopy species are very slow to emerge in regenerating areas even if there are seed sources.

This raises the question of what forest types (meaning combination of species), best provide for current social and cultural, economic and environmental values, and what alternative transition pathways exist to support long-term objectives while meeting the immediate need of climate change resilience?

Practical experience and research to date is indicating that:

- The ultimate goals of any transition must be very clear and widely agreed. What values are being sought? What risks need addressing? What resilience characteristics do future forests need?
- Mixed indigenous–exotic forests with a design focus on the tall-canopy species are likely to be the most cost-effective to establish and meet the widest set of potential goals.
- Planting design (landscape planning) is critical to matching species with terrain and aspect.
- Planting densities need to reflect goals, as well as the cost of planting – i.e. more than 1500 stems/ha would seldom be needed.
- Post-planting management of weeds and pests is critical.

Nelson's forest landscape

Whakatū Nelson is a village city set against a forested landscape much of which drains through the city and suburbs. This backdrop of forested water and conservation reserve lands are a fantastic community asset in recreational and ecological resilience terms in the face of a rapidly changing, and increasingly challenging, climate.

These forests consist of over 10,000+ ha of indigenous species (old growth and regenerating), a 700 ha fenced conservation reserve (Waimarama Brook Sanctuary) and approximately 600 ha of commercial forests (or lands in some stage of transition out of commercial use). In addition to these NCC forests, there are also extensive private (mostly commercial) forests within the city boundaries (see the map on the next page).

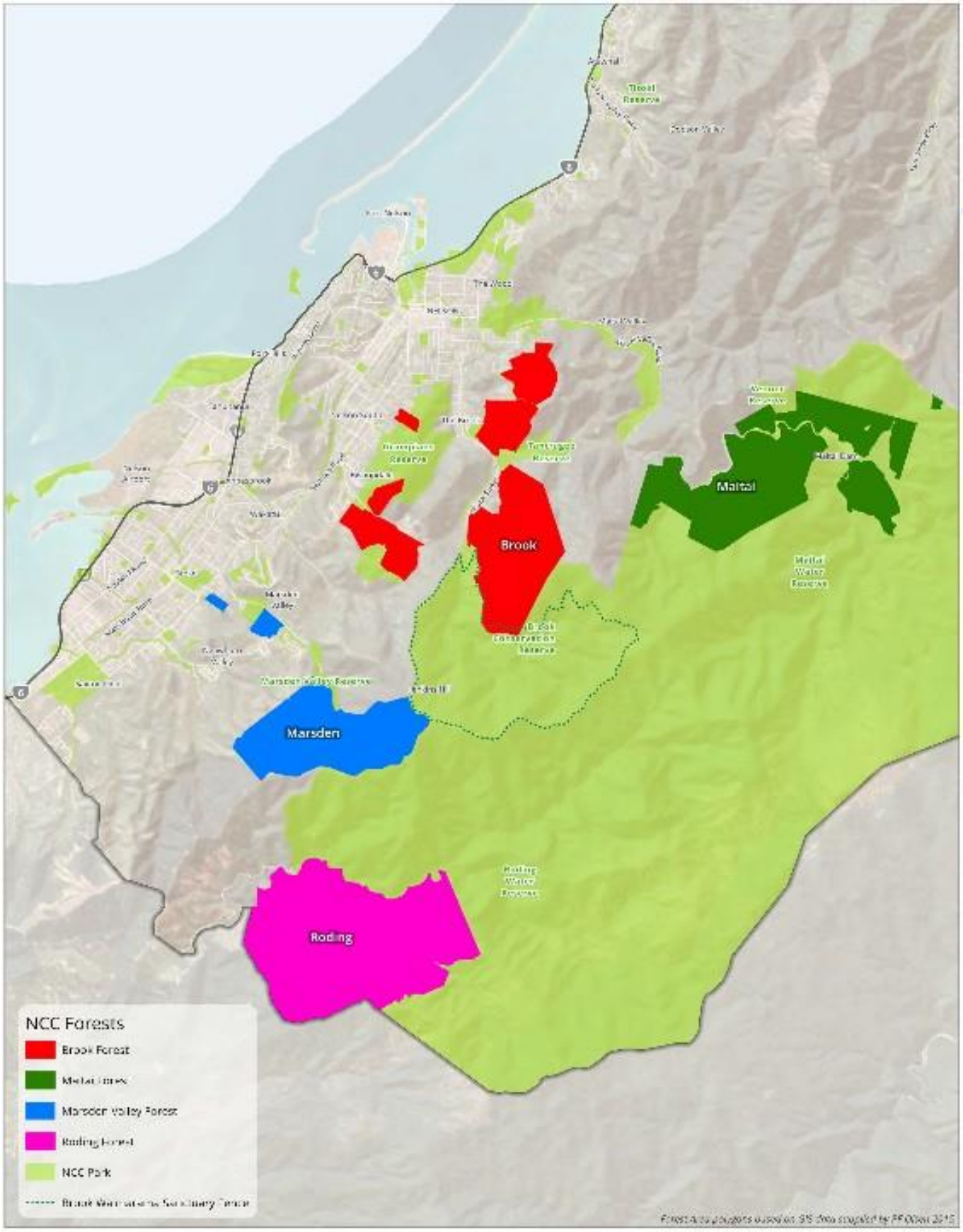
The future of these forest lands depends on achieving clarity around:

- the attributes which are of most value to the community
- the risks which lie within the landscapes themselves, and,
- the opportunities that exist to mitigate those risks and enhance the values, through changes to forests and their management.

What is a forest?

Land spanning more than 0.5 ha with trees higher than 5 m and a canopy cover of more than 10%, or trees able to reach these thresholds (UN-FAO Global Forest Resources assessment 2020).

Why define a forest? Because globally, one of the most constant characteristics of a forest is its tall canopy-forming species and these are a critical element of the long-term resilience of forests



NCC Forests

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Responding to the challenge

The Right Tree Right Place (RTRP) Task Force was established by NCC following several years of debate about the value of the city's 600+ ha of commercial forests. A desire for a review of transition options was evident.

It was recognised that any transition needs to take account of the need to maintain and enhance the biodiversity and resilience of the entire forest estate. To do otherwise may result in significant biodiversity loss in the 10,000+ ha while 'rescuing' a few hundred. The Task Force therefore approached its review of 'why' and 'how' and 'whether' to transition the few hundred hectares of (mostly) pine forest to other forest systems, through a 'whole-of-forests' lens.

The Task Force's Terms of Reference (TOR - Appendix 1) reflected the need to also account for a wide range of community values and this complexity led to the Task Force starting with the following aspirational statement:

> *A resilient, continuous canopy, forested landscape, rich in biodiversity, that supports the many values of the people of Te Tauihu and our future generations.*

The Task Force review is thus a complex systems study involving physical, ecological, economic, social, timing and political elements. The study traverses a number of long-term, strategic matters through to the physical, ecological, social, and fiscal realities of the 'here and now' commercial forestry and options for transition to other forest types.

This document outlines the process undertaken by the Task Force to address a recognised need for system-level change in the management and objectives of NCC's forest lands.

It then provides recommendations on needed changes, from planning to establishment of forest systems (e.g. closed canopy), that deliver on a broader range of values and that are resilient. Recommendations are supported by review papers addressing key issues and frameworks for decision making as well as catchment scale overviews and transition options for commercial forests in the Maitai, Brook, Marsden, and Roding catchments.

Gathering the evidence

The Task Force collected and carefully considered the following inputs:

- Many reports and policy and planning documents relating to NCC's commercial forests and their future management, and, in particular, a wide range of research studies and their outcomes on transition efforts – changing from commercial pine forests to other species, notably indigenous ones. More than 125 documents were accessed and included in the Task Force database.
- A range of physical and electronic data and advice from NCC operational departments on the forested landscapes, erosion and flooding risks, weed and animal pest matters, this last proving to be a major threat to indigenous biodiversity.
- Comments, suggestions, recommendations arising from three public meetings: two well-attended (and well-participated) workshops with a range of interested parties, and an in-depth roundtable discussion with more than a dozen forest transition, technical specialists.
- Visual, tactile and auditory 'takeaways' from field visits to all four commercial forest catchment areas, one of NCC's recently transitioned areas, and visits to Silvan Forest (a private mountain bike and amenity park overlooking Richmond) and Kingsland Forest Park (a Tasman District Council (TDC) amenity forest project east of Richmond).

- Data and information acquired following the development of four review papers (Appendix 3) that examine important elements of the study
- Data and information acquired following the development of four catchment papers (Appendix 4; one each for the Roding, Marsden, Maitai, and Brook forests), that was collated by their physical elements as well as the opportunities and risks of those areas and various land-cover options they create, relevant to the commercial forests. These four papers 'drill down' to the status of, and options for, all NCC commercial forest stands.
- Visual/graphic data and information resulting from the reconstruction of GIS-based, commercial forest maps, including reconciliation of all stands with their locations and management histories.

The Task Force reviewed these resources, producing outputs and recommendations on:

- the extent of NCC's entire forest estate, its overall condition and the management of commercial forests within the estate
- the range of values the NCC forest estate delivers to Nelson and to the wider community
- the risks inherent in the current commercial forests and any transition processes
- the financial returns from NCC's commercial forests over recent decades
- the integration of commercial forest management and the wider functions of NCC Parks and Reserves and NCC Science and Environment teams, particularly the transfer out of commercial forest management into transitioning to other forest types
- the rationale for current commercial forests and the case for reviewing transitioning options to other forest types to meet a wider range of values
- the science of transitioning from pine forest to forest of other species, indigenous and/or exotic, and the cost effectiveness of such transitions
- major forest transition projects underway in Tasman District and their potential applicability to NCC's forest lands.

The Task Force has not reviewed:

- the many, current, long-term policies and plans covering the NCC's forest lands given that they are outside the Task Force's TOR and are not in conflict with the TOR's intent
- ...nor provided advice on the management by, and performance of, the commercial company (PF Olsen Ltd.) servicing NCC's commercial forests under their second 5-year contract
- the performance of any part of the NCC's team involved in the management of the forest estate.

Framing the inquiry

A values-based approach was used to frame the Task Force enquiry (see the diagram below, depicting the key values 'circles'). These values were developed from existing sources of information as well as from input during meetings with interested parties.

Key, high-level outcomes to be considered included:

a. Environmental

- Climate-positive outcomes are achieved, including resilience and permanent carbon sequestration

- Improvements are made to air, soil and water quality
- Damage caused by flooding, sedimentation and pest activity is minimised through effective mitigation planning and applied techniques
- Biodiversity is enhanced through the restoration and establishment of continuous-canopy forest

b. Social and cultural

- Positive intergenerational outcomes are provided for
- Community amenity values – enjoyment, well-being, and healthy, pleasant quality of life – are maximsied
- Community recreational values are maximised

c. Economic:

- Financial benefits to council (and wider regional economy) are optimised, by considering net revenue and economic benefit from productive and broader alternative uses (recreational, indigenous flora), and opportunity costs

Key values and desired outcome areas

Each of the value elements for consideration intersect and overlap to provide for the critical outcomes needed – including enhancing biodiversity[1] and ecological resilience.

The Task Force also notes the impact of pests and weeds on forest flora and fauna as severe, widespread and significantly reducing biodiversity. Addressing this ongoing loss is key. Also, several events from recent years have illustrated the need to address the risks posed by our changing climate.

This values-based approach aligns with a Māori worldview, which considers the integrated human–nature relationship: living as nature rather than living off nature.

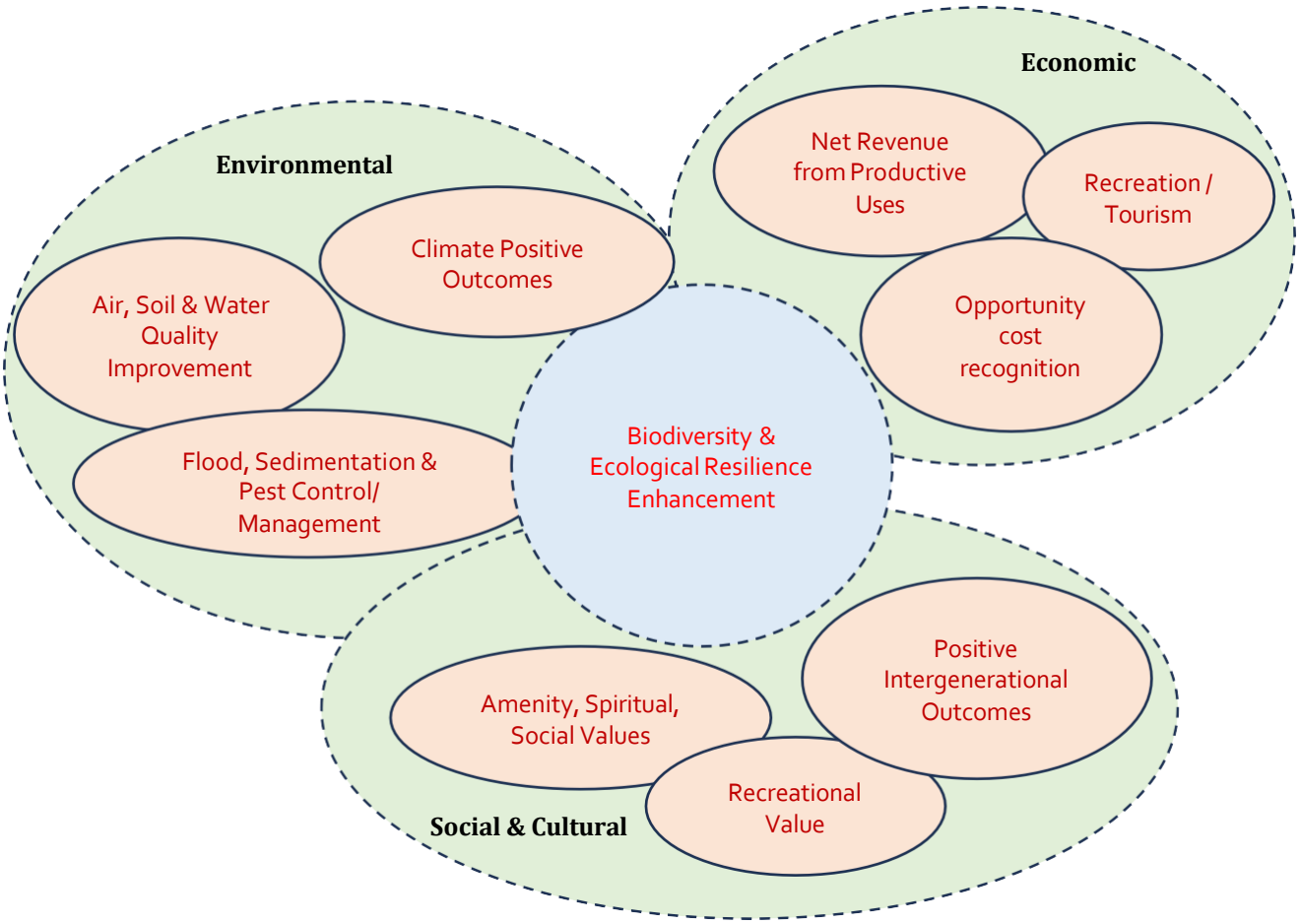
An aspirational statement that summarises a future vision for the NCC forests estate is:

"A resilient, continuous canopy, forested landscape, rich in biodiversity, that supports the many values of the people of Te Tauihu and our future generations".

Given the many aspects of forests that we value, one of the big challenges is reaching agreement on which forest type(s) can best achieve agreed values. Forest options, which provide for identified values, come with benefits and opportunities and with costs and risks, some due to our rapidly changing climate – as evidenced already by wildfires and flood damage.

This challenge is addressed in part with a strategic planning process (see Paper #2, Appendix 3) and also in this Report by considering what science and experience on the ground tell us.

[1] Biodiversity, or biological diversity, means the variability among living organisms from all sources including land, marine and freshwater ecosystems and the relevant ecological complexes; this includes diversity within species (including genetic diversity), between species, and of ecosystems. Definition based on Convention on Biological Diversity, as noted in Biodiversity in Aotearoa (Department of Conservation 2020).



Key values bubbles

System reviews

The need for four background systems reviews emerged early as the Task Force realised the breadth and complexity of the systems that influence the future of NCC's commercial forests. The reviews provide critical supporting evidence for strategic recommendations and many operational recommendations subsequently developed by the Task Force.

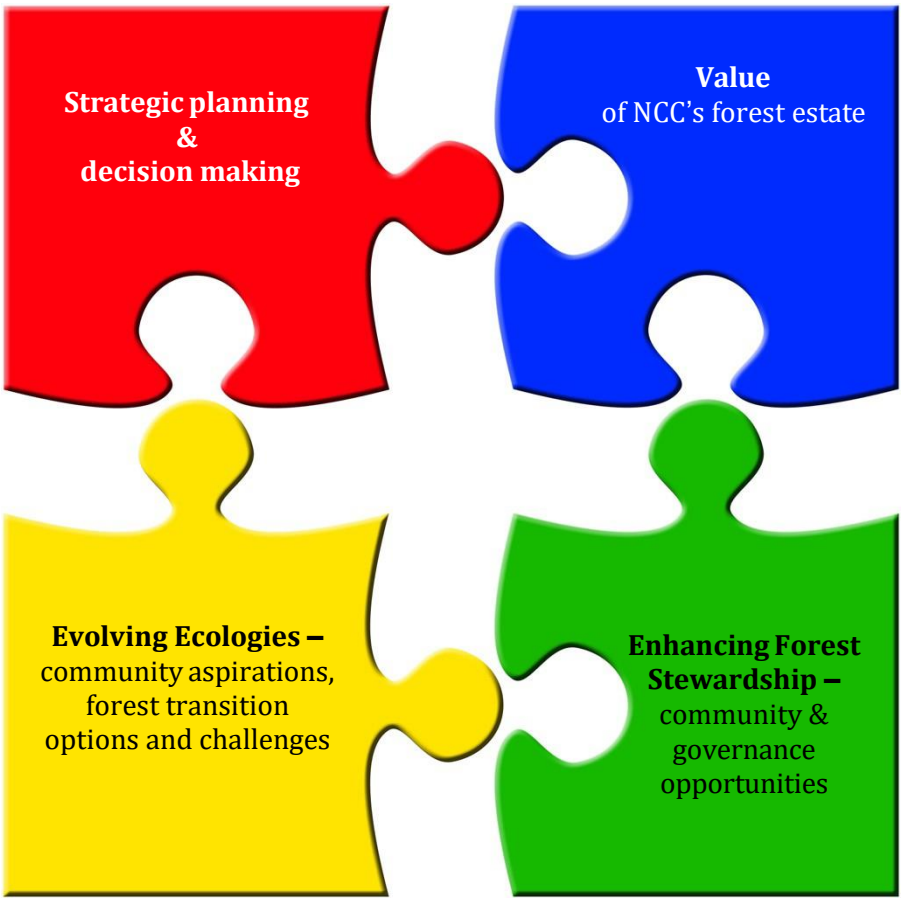
A summary of the system reviews and their approaches

Strategic planning and decision making. This review explores options for the future management of all commercial forest stands within the greater forest estate. It takes a risk–opportunity-based approach that works on the basis that most, or all, current commercial stands will ultimately remain in a closed canopy forest of indigenous and/or exotic species to meet desired values and mitigate risks (see Appendix 3).

Value of the NCC forest estate. This review explores the net value of production forests in terms of NCC's goals that, for these lands, focus on revenue generation. It looks at the potential fiscal value of the estate and NCC's ability to realise it. Revenue includes ETS-based carbon values as well as timber (see Appendix 3).

Evolving ecologies: community aspirations, transition options and challenges. This three-part review looks first at what the community's values and aspirations are for the extensive NCC forested lands (10,000+ha inclusive of the commercial areas), while subsequent parts review the now extensive, and growing, ways to transition forest and landscapes: species choice, time frames, cost effectiveness and weed management matters (see Appendix 3).

Enhancing forest stewardship: community and governance opportunities. This review explores the relationships that communities have with their forests, including the very diverse range of values sought by these communities. These relationships are viewed from global and New Zealand perspectives and ideas are presented for strengthening the community's stewardship, governance and management of publicly owned forest lands (see Appendix 3).



Catchment reviews

Catchment reviews consist of a common framework that enabled the Task Force to:

- define an approach and collate key characteristics of the areas
- identify risks and opportunities
- identify all commercial forest stands
- make recommendations for their short- and long-term future management as input to those developed by the Task Force.

The following information notes key features of the commercial forests in each catchment and is based on content from NCC's Forestry Activity Management Plan 2021-20312, together with additional information and commentary based on Task Force members' personal observations and other data acquired during the Task Force's review.

Further (detailed) information collated by the Task Force can be found in individual catchment reports (see Appendix 4).

[2]Forestry Activity Management Plan 2021–2031, p24-25, accessed 28 Oct 2023.

Maitai Catchment

The Maitai Forest (186.8 ha) is made up of many small blocks, which stretch for approximately 10 km along the Maitai Valley Road and above the Maitai Dam reservoir east of Nelson City. Approximately 25% of the area is above the Maitai reservoir and water supply intakes.

The remaining forest blocks are on predominantly steep hill country, adjacent to the Maitai River. Although these areas fall outside of the water supply catchment area, they have been regarded as buffer zones for the catchment. Erosion susceptibility maps are currently being updated (by the end 2023) by the Sustainable Land Management Programme.

Access is from Maitai Valley Road via formed tracks to stands 3–10. Access to stands 1 and 2 is currently via Koata Ltd land, through forestry managed by Tasman Pine Forests Ltd.

The Maitai River (upper, middle and lower) is highly valued for mahinga kai, recreation, natural and scenic values. Water quality is of primary concern to residents.

There is some recreation activity through these forests, including some mountain biking trails and a section of the Coppermine Trail.

Previous recommendations included that some of the Maitai stands be retired for alternative indigenous land use, mainly those in proximity to the Maitai River or the Maitai Dam (see Appendix 4 for the Maitai Catchment report).

Marsden Catchment

The Marsden Forest (142.4 ha) is located 4 km southeast of Stoke, at the end of Marsden Valley Road. The main plantation is on north-facing slopes on the Barnicoat Range between Jenkins Hill and Saxton Hill. The forest bounds an indigenous reserve on the north-eastern side with farmland to the west and neighbouring exotic forest plantation to the south.

Poorman Valley and Orphanage Valley streams both originate on this land and then traverse suburban Stoke. The planted forestry is a significant proportion of these stream catchments. Formed access roads connect with Marsden Valley Road.

The Marsden forest attracts a range of recreation activities, primarily accessed through Glider Road. They include walking, running, paragliding and access to popular mountain bike trails such as Involution.

Previous recommendations acknowledged the need for urgent replanting or transition following harvest given the large proportion of the stream catchment (see Appendix 4 for Marsden Catchment report).

Brook Catchment

The Brook Forest (132.4 ha) is in four separate blocks including: a) a backdrop to the Brook Street section of Nelson City, b) upper Brook Valley on steep hill country, c) York Valley behind Bishopdale, and d) on a north-facing slope of the Grampians above a residential area of Nelson City. Part of the York Valley Block is on land designated for refuse disposal.

The Brook forest is a very popular recreational area, for biking and walking, with a significant biodiversity corridor. All Brook forest areas are extensively used for recreation including the Grampians, Codgers Trails and the Coppermine Trail. An important feature of the Brook is its close proximity to the city centre, residential neighborhoods (pop. 2060), schools, a campground, community gardens, a Riding for the Disabled area, Brook Waimarama Sanctuary, Significant Natural Areas (SNA). As

is the case with the Maitai and Marsden catchments, all forestry blocks are within the Nelson Halo.[3]

The Brook Catchment accommodates the primary water treatment plant for the city, treating water from Maitai and Roding rivers. There are seven public reserves and a heritage precinct within Brook Valley.

Narrow one-way roads with logging trucks are a safety concern. Most of the forestry stands in the Brook were previously recommended for retirement for alternative indigenous land use, with the exception of the blocks on Fringed Hill (see Appendix 4 for Brook Catchment report).

Roding Catchment

The Roding Forest (232.5 ha) is located approximately 13 km east of Richmond, at the end of Aniseed Valley Road. It is bounded by Tasman Pine forest in the west (contiguous) and north (over the public road and running uphill to the Marsden forest boundary on the ridge), and by NCC and DOC land to the south and east.

About 50% of the Roding forest catchment drains towards the Roding River upstream of the Roding River water supply intake, which diverts water through a tunnel to Marsden Valley. The topography is generally very steep, and altitude rises to 900 m.

Internal forest roads and tracks are already established to provide access to all parts of the forest. Current harvesting uses cable harvesting systems owing to the steep terrain.

Recreation is less common in the Roding forest due to distance from urban areas, though walking and mountain biking are popular, albeit on a smaller scale than other forests.

The Roding has a rich mining history and there are a number of remnants. The forest was purchased by NCC as a commercial investment and a means of protecting its water supplies from hazardous effects such as erosion and sediments (see Appendix 4 for Roding Catchment report).

Recommendations

These recommendations are based on a Task Force consensus that a number of factors combine to show that continuation of current commercial forestry by NCC in all current areas is not warranted beyond harvest maturity of most current rotations (approximately 20 years).

These factors include:

- negative impacts on public access and safety, and catchment impacts
- the many, smaller, distributed pieces of forest lands involved
- proximity to urban areas
- existence of commercially non-viable stands
- low financial returns of many stands over many years.

While taking into account all these factors, it is also acknowledged that a number of the current commercial forestry areas can, and do, support excellent tree growth. This needs to be recognised in any and all transition efforts.

The Task Force's view is that there are a range of other values, of long-term benefit to the Te Tauihu community, and that these values can be best realised through a cost-effective programme of transition to a resilient, continuous-canopy, mixed-species

[3] http://www.nelson.govt.nz/environment/nelson-nature/natural-environment/the-nelson-halo/, accessed 28 Oct 2023.

forest system that incorporates high-value timber species, which could enable selective harvesting while retaining forest integrity, should future communities wish to do so.

Our recommendations are in three groups, representing critical levels of decision making – all interlinked and all essential to achieving the opportunities and management needs of NCC forest lands.

The three address:

- Opportunities to 'see', and manage, the entire 10,000+ ha of NCC forests as a single entity of several parts; these are at the strategic governance and leadership level.
- The future management and opportunities common to all 600+ hectares of commercial forests and lands in the four catchments involving 83 stands.
- Specific risks in some catchments that are a priority for transition investment. These recommendations should be considered in the context of the full catchment reviews and relevant observations on transition options for particular stands.

In addition, the Task Force earlier made two sets of operational recommendations as our enquiry had identified that urgent action was considered essential to reduce risks and to reduce potential costs of proposed transitions.

The three levels reflect the order of importance of our recommendations.

Framing the recommendations – First level

The first, all forested lands, focuses on strategic matters key to large system management, NCC's entire forested lands, as this ensures the many values across this landscape can be more effectively delivered - be they biodiversity goals, mountain biking or pest control. It requires cohesive leadership, focus on key risks and strengthening relationships with the wider NCC community.

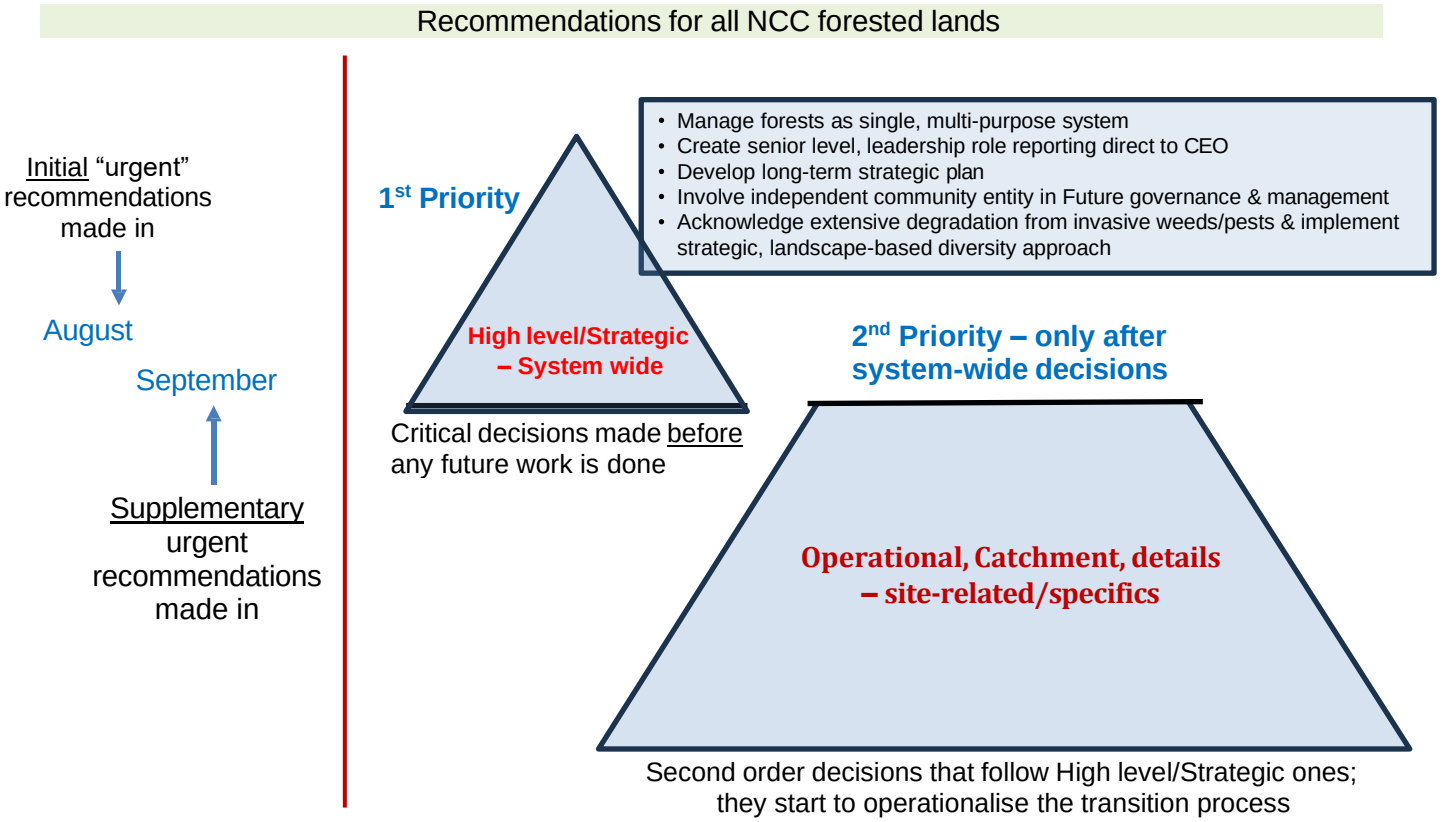
The diagram below shows the relative importance of the 'key/critical' strategic recommendations --which must be acted upon as a matter of urgent priority (the 'tip' of the pyramid) -- versus the other, more operational recommendations which would follow the initial strategic decisions related to goal setting and governance.

Strategic, governance, and leadership

All forested lands – the entire 10,000+ha

1. All Nelson City Council forested lands (the 10,000+ hectares) should be managed as a single, multi-purpose forest system encompassing all conservation, water and landscape reserves.
2. Nelson City Council should create a senior-level, forest systems leadership role (reporting directly to the Chief Executive), with accountability for ensuring strategic oversight, integration and coordination of all Nelson City Council forest management – including restoration, weed and pest control, investment and transition operations.

   Note: the Task Force considers this position critical to a future effective and efficient management of a very large Nelson City Council asset – one that is unique to the city and with many benefits to residents, visitor, and natural habitats. See Paper #2 Strategic Planning and Decision Making (Appendix 3).
3. Nelson City Council should develop a long-term strategic plan for all its forested lands that is designed to achieve desired values and opportunities while mitigating major risks, e.g. weeds, pests and particularly climate change.



4. Future governance and management of Nelson City Council's forest lands should include an independent community entity to maintain a tangata whenua and intergenerational input, plus facilitate private and public investment in all future forest management.

   Note (i): See Paper #3, Enhancing forest stewardship – community and governance opportunities (Appendix 3), which outlines many examples of the role that community trusts and volunteers are playing in the management of New Zealand forest reserves and sanctuaries. Overseas examples are also highlighted.

   Note (ii): This recommendation also acknowledges current input by volunteers to Nelson City Council forest care, while emphasising the additional community empowerment that 'friends of the forest' legal entities, such as trusts, can provide through input to long-term strategies and investment. Such community input to (and often actual ownership of) forests is widespread globally, with European examples spanning centuries.

5. Given the high numbers of invasive weeds and pests in the entire forest estate and the potential (and actual) biodiversity loss in indigenous forests, there is an urgent need to acknowledge this degradation and to develop and implement strategic, landscape-based approaches to reduce pest damage and thus protect biodiversity.

   Note: Recent ungulate surveys have highlighted the scale of this risk, as has the lack of extensive possum control (see Paper #4, Part 2, Appendix 3).

Framing the recommendations – Second level

This second level of recommendations apply to all commercial forests and begin to address operational matters. They cover transition planning, funding for transition

costs, the use of carbon credits, species choices and costs of various transition options.

They also include the urgent operational recommendations that the Task Force made to the NCC CEO during the course of the investigation. Most significant of these were:

- That until the NCC has a plan, process, and resources in place to transition existing and future (cutover) vacant land, P F Olsen Ltd be directed to halt all harvesting in the Marsden Block (Douglas fir and *P. radiata*), to be effective immediately.
- Further to the above recommendation, that harvesting be halted in all other areas until Task Force recommendations are received by NCC.

The purpose of these recommendations was to halt the increase in the area of bare land (that would require transition investment), given that over 100 ha was already vacant and with much of it subject to the pre-1990 liabilities related to the requirement to be re-planted within 4 years of harvest.

Commercial forested lands

6. All current commercial forests should be transitioned to continuous canopy forest systems (mostly of mixed species) to best meet community values and address climate risks.

   Note (i): Transition processes will need to be flexible and innovative given the variability of aspect, slope, access, and wilding and weed risks.

   Note (ii): This recommendation does not preclude future harvest of high-value species using low-impact methods (i.e. no clear-felling) applied selectively to target trees or small stands (see Paper #4, Appendix 3).

7. To improve the transition's affordability, Nelson City Council should undertake an independent costs and benefit analysis to identify opportunities to raise revenue[4] via:

   a. selling identified cutting rights to select stands for one rotation, inclusive of conditions relating to: ongoing public access, forest management, harvesting, time frames and hand-back

   b. optimising New Zealand Emissions Trading Scheme benefits from eligible stands

   c. using local government powers to raise loans or levies through facilities specifically supporting nature-based investments.[5,6]

   Note: The Task Force makes this recommendation in recognition of the challenges Nelson City Council faces to fund the needed transition out of commercial forestry to other forest types. It recognises that there are other potential funding sources but comment on them is beyond the Task Force's scope.

8. All forest returns (and carbon credits) earned since the forests were reregistered into the New Zealand Emissions Trading Scheme are to be 'ring-fenced' in Nelson City Council accounts, to help fund forest transitions and restoration (Paper #1, Value of Nelson City Council forest lands, Appendix 3).

   Note: This should include May 2023 New Zealand Emissions Trading Scheme credits received (14,453) and any carbon credit sales income.

[4] See Value of NCC's Forest Estate – Appendix 2B.

[5] https://www.lgfa.co.nz/sustainability/sustainable-lending/green-social-sustainability-loans, accessed 28 Oct 2023.

[6] https://www.legislation.govt.nz/act/public/2020/0047/latest/whole.html#LMS243290, accessed 28 Oct 2023.

9. Nelson City Council should implement a Geographic Information System-based, forest management system for data storage, mapping, analytics, and financial records for all forested lands.

   Note: Reconciling the history of all commercial forest stands has proved very challenging for the Task Force and the importance of investment in monitoring and tracking many aspects of forest health, pest impacts, etc., was highlighted by Nelson City Council staff and other professionals consulted.

10. All forest stand transitions should have a site-specific plan based on assessing and mapping, for example, using Geographic Information System mapping and landscape planning (of soils, slope, aspect, access, weed profile, soil moisture, and any cross-boundary impacts), to determine or identify: goals that the plan addresses, species fit, the resilient forest type desired, and projected costs to canopy closure (Evolving ecologies, Paper #4, part 2,Appendix 3).

    Note: This recommendation does not apply to any transition currently underway.

11. The species included in any and all transition plantings should be those, based on the current state of knowledge, that best contribute to the ultimate goal of a resilient, biodiverse, continuous-canopy, tall-tree forest, within soil and topographical constraints (Evolving ecologies, Paper #4, part 2, Appendix 3).

12. Passive regeneration (without any augmented plantings) should not be attempted on Nelson City Council commercial forest lands, whether pre-1990 or post-1989, New Zealand Emissions Trading Scheme registered or not, without a thorough assessment of the risk that the land could end up being classified as 'deforested'. (Evolving ecologies, Paper #4, part 2, Appendix 3)

    Note: The concern is indigenous regeneration rates are very slow in some locations and the delay in development brings with it the risk of the land being classified as deforested, which must be considered.

13. All transitions should take account of realistic transition costs (see next page - Focus on: How costs were estimated).

Recommendations requiring immediate action:

14. Recommendations to Nelson City Council Chief Executive to cease all harvesting immediately (submitted 7 August 2023) -- to prevent further commercial forest land being cleared before there were plans for transition (See Appendix 2 for details)

    Note: Recommendation accepted and actioned

15. Recommendations to Nelson City Council Chief Executive to commission essential weed control on cleared stands over the 2023/24 summer and autumn (submitted 28 September 2023) (see Appendix 2A for details).

    Note: Recommendation acceptance pending

Focus on: How costs were estimated

There are myriad factors to be considered when transitioning from a monoculture forest to a diverse forest system. Key to the transition is identifying the approach most appropriate for the specific area and clearly defining the outcomes sought. Various approaches are discussed in more detail in Appendix 3, paper #4.

Range of costs and quantities to consider when transitioning a cleared area:

- plants (shrubs or trees)
  - indigenous: $3–$6 per tree (Hunua project is experimentally sourcing <$1 per tree)
  - exotics range from 45 cents to $3.50 per tree
- labour to plant (per hour or per hectare)
- pre-planting weed spraying (one, two or three spray treatments) and method of spraying (hand wand and/or backpack, helicopter, ATV-borne tank, etc.)
- density (as stems/ha; distance between plants) ranges from 300/ha to over 6000/ha
- sleeves $3–$6 each (including stakes).

For regeneration of immature radiata pine forest (by thinning)

- From initial (average) 750 stems/ha, thin to 150–250 stems/ha; after a few years, dependant on regeneration, totally clear, allowing costs of $800–$1,000/ha.[7] In Hunua Ranges forest transition, thinned trees are left to rot to save costs and for ecological benefit.[8]

	Pine		Redwood/ Cypress		Mix of exotic/ indigenous		Indigenous	
Total costs/ha (plant, pre- & post-plant 3yr) ($)	Low	High	Low	High	Low	High	Low	High
(incl: stock, planting, management fees, sprays, sleeves/protectors)*	2,727	3,735	8,980	12,979	8,935	27,014	13,075	83,561

* see Table of Costs in Appendix 5

- The lowest cost of transition plantings ($8,935) was for a mixed indigenous and exotic planting, while the highest was for indigenous species only, with no spraying for weed management allowed. High averages involve more expensive indigenous plantings.
- Other potential costs include:
  - Wilding (pine, fir, other) control, at $500/ha–$2,500+/ha
  - Pests other than weeds, such as deer, pigs, possums. *Note: These should be part of a control programme that covers the entire NCC forested lands and control would be ineffective if only applied to transitioning areas.*
  - Annual increase in prices for labour, chemicals, imported machinery, etc.

In the real world, the cost of replanting and associated costs depends on too many variables to allow the use of average estimates. The Task Force notes that only an actual, site-based analysis will provide an accurate basis for identifying a preferred transition approach, and for estimating planting and other costs, with important factors being:

- Community values, opportunities and risks; thus, what outcomes are desired
- Transition design and evaluation skills, and capacity
- Topography (flat, hilly, steep); aspect (sunny, shady); rainfall (low, medium, high)
- Presence (and type) of weeds and pests.

[7] Rhys Millar pers. comm. Oct 2023.

[8] Hunua Forest Restoration Project (Watercare) (December 2022), Ahika consulting – provided by Rhys Millar in pers comm.

Framing the recommendations – Third Level

This third level provides recommendations for specific risks in each of the catchments containing commercial forests. The Task Force, when drawing them up, collated all available data on the 83 current stands of mostly *P. radiata*, evaluated the transition options for all stands under four categories, and ranked the potential transition options from now, in less than 10 years and in more than 10 years.

This synthesis of the opportunities, and options, for the transitioning of all forest stands is largely aimed at providing an empowering framework for action, by the teams that will plan and action transitions, over the next 20 years. A few stands, particularly in water catchment areas, have warranted specific recommendations given that action is needed as soon as possible. The same applies to all areas currently cleared, with bare or grassed land.

Catchment transition options and high priority areas for action

16. It is recommended that all currently bare land, identified in catchment stand-by-stand assessments as 'currently cleared or awaiting transition' be a priority for transition planning and action, and any reforestation requirements of pre-1990 stands or post-1989 New Zealand Emissions Trading Scheme requirements be taken into account (Appendix 4, catchment reviews).

    Note: It is the extent of current bare land (over 100 ha) that lead to the Task Force recommending that further harvesting should be halted. It presents a significant risk both ecologically and fiscally in its current state.

17. Priority should be given to transitioning stands 9.04, 9.05 and 9.07, of young P. radiata and draining into the Maitai Dam reservoir and the south branch of the Maitai River just upstream of the water intake, and stand 9.02, a cleared stand but now infested with wilding pines and also upstream of the water intake (Appendix 4, Maitai Catchment review).

    Note: There is potential to transition via augmentation of current regeneration with plantings of indigenous species, provided weeds can be managed.

18. Priority should be given to enhancing protection of the Roding water catchment areas upstream of the supply intake. Enhancement of riparian margins and transition options should both be priorities (Appendix 2A, Supplementary recommendations, and Appendix 4, Roding Catchment review).

19. Priority should be given to riparian plantings on the steep gully section of stand 42.05 in the Marsden catchment below Glider Road. It is at high risk of erosion, with the sediment potentially entering Poorman Stream (Appendix 2A, supplementary recommendations and Appendix 4, Marsden Catchment review).

Catchment Reviews - content

Four Task Force members were allocated one of the four catchments to review in-depth. These four authors also collaborated on their research and findings, to ensure shared understanding of common issues (such as weeds and pests) and to produce a more meaningful catchment analysis and recommendations pertaining to all catchments.

The reviews involved collecting, organising, analysing and summarising a range of data and information related to physical elements (e.g. topography, current planted species, rainfall, aspect, soil characteristics) as well as the opportunities and risks presented by the current forestry situation(s).

The following pages show details of the commercial forest(s) in each of the four catchments, based on NCC's Forestry Activity Management Plan 2021–2031, including extensive detail of stands, location area, age of trees, etc. with added information and

commentary based on Task Force members' personal observations, as well as other data acquired during the Task Force's review.

Catchment reviews consist of a common framework that enabled the Task Force to:

- define an approach and collate key characteristics of the area
- identify risks and opportunities
- identify all commercial forest stands
- make observations or note key findings for the stands' short- and long-term future management.

Each Catchment review included these types of comparisons and/or analyses:

- maps related to the catchment area
- parameter setting, using the Task Force Aspiration statement and its "Key Values" (see pages 8 and 9)
- an overview of the forest area
- key elements to consider
- scenario assessment, which entailed considering a range of four options or alternatives to suit NCC's forested lands, as applied to each catchment, being:
    - continue plantation forestry beyond the current rotation
    - transition to alternate timber species (exotic and indigenous)
    - transition to mixed exotic and indigenous amenity forest
    - transition to indigenous forest via natural regeneration or replanting
- financial analyses of net revenue from production forestry
- catchment stand-by-stand assessment, reviewing the stands of each catchment across the four scenarios and providing additional information for each stand (stand identifier, area, value, species, and year planted)
- key observations
- areas for action for the catchment and its forest stands
- catchment opportunities.

It is important to stress that these reviews have informed the development of all recommendations relating to the commercial forests and are intended as a robust source of information for those designing and managing the desired transitions of forests. Links to all reviews are in Appendix 4.

Please note, in the tables that follow:

* indicates that this stand is in the ETS

** indicates this stand has been felled

There are also some additional stands which have been partially felled, in both the Roding and Marsden forests.

Maitai Catchment stand-by-stand assessment

Note: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master stand list				**Assessment against scenarios (all of which produce tall canopy forests)**			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇							
MAIT 1.04	-	P radiata	NA			✓✓	✓✓✓
MAIT 2.01	0.23	P radiata	1981**				✓✓✓
MAIT 2.03	5.08	NA	0**		✓✓		✓✓✓
MAIT 3.01*	1.14	NA	0**		✓✓		✓✓✓
MAIT 3.02	2.72	NA	1986**			✓	✓✓✓
MAIT 3.03*	5.88	NA	0**		✓✓		✓✓
MAIT 4.03	0.61	NA	0**			✓	✓✓✓
MAIT 4.05	14.57	NA	0**		✓✓		✓✓
MAIT 4.07	0.48	NA	0**		✓✓		✓✓
MAIT 4.11	18.06	P. radiata	1995**		✓✓		✓✓✓
10 stands	**~ 48.77 ha**						
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇							
MAIT 1.01	10.25	P radiata	1981		✓✓		✓✓✓
MAIT 2.02	2.94	P radiata	1981		✓✓		✓✓✓
MAIT 4.04	0.45	D fir	1986			✓	✓✓✓
MAIT 8.02*	3.82	P radiata	1991				✓✓✓
MAIT 9.01	2.98	D fir	1997		✓✓✓		✓✓✓
MAIT 9.02	5.17	NA	2019		✓✓✓		✓✓✓

Stand information per master stand list				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
MAIT 9.04	2.07	NA	2019		✓✓✓		✓✓✓
MAIT 9.05	25.96	P radiata	2018		✓✓✓		✓✓✓
MAIT 9.07	1.03	P radiata	2018		✓✓✓		✓✓✓
MAIT 10.02	2.53	P radiata	1992				✓✓✓
MAIT 10.04	1.84	NA	2019				✓✓✓
11 stands	**~ 59.04 ha**						
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇							
MAIT 1.05*	20.38	P radiata	2020		✓✓	✓	✓✓✓
MAIT 2.04	15.28	P radiata	2011		✓✓		✓✓✓
MAIT 3.04	1.7	NA	1995				✓✓✓
MAIT 3.05	9.94	P radiata	2011		✓✓		✓✓✓
MAIT 4.08	0.98	Acacia Melanoxylon	1995			✓✓	✓✓✓
MAIT 4.09	0.11	Macrocarpa	1995			✓✓	✓✓✓
MAIT 4.12	0.98	P radiata	1993			✓✓	✓✓✓
MAIT 4.13	0.53	D fir	1996				✓✓✓
MAIT 4.14	1.13	P radiata	2009			✓	✓✓✓
MAIT 4.15	14.01	P radiata	2018			✓	✓✓✓
MAIT 4.16	3.17	P radiata	2020			✓	✓✓✓
MAIT 5.01*	2.26	P radiata	1995		✓✓		✓✓✓
MAIT 5.02	0.44	P radiata	1992		✓✓		✓✓✓
MAIT 7.02*	0.97	P radiata	1993			✓	✓✓✓
MAIT 8.01	0.31	Eucalyptus	1990		✓✓		✓✓✓

Stand information per master stand list				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
15 stands	**~ 72.19 ha**						
36 stands	**~ 180 ha in Maitai Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring**						

Maitai forest block observations and preferences

The majority of the Maitai forestry estate is associated with Nelson city's water supply or adjacent to the Maitai River along Maitai River Valley Road. The catchment has very high water and soil protection value and risks, as well as high biodiversity, recreational, amenity and tourism economic value. There are known risks from production forestry: its potential to impact the Maitai Dam reservoir, river and estuary (primarily through sedimentation), roading and access to key water infrastructure.

All stands within the Maitai catchment should be transitioned away from clear-felling, prioritising soil and water protection, recreational and biodiversity outcomes from today, with particular emphasis on track and trail planning (create easier grade trails and separate-use trails where possible), and on planting indigenous emergent and seed species, to support habitat enhancement for birdlife. Activity above the reservoir and water supply intakes should be managed to minimise sediment and other contaminants, including any potential impacts from increased recreational use or the establishment of an indigenous forest timber park. Establishment and/or extension of wider riparian buffers is essential.

Key observations and preferences related to the Maitai Catchment:

- Given the significant risks commercial forest harvests pose to water sources it is recommended that transition of all compartments draining into the Maitai Dam reservoir and Maitai River (South branch) above the water intake be given priority while the current *P radiata* stands are still young and regeneration is occurring.
- All areas need to be actively managed for pest and weed control.
- There is a need to be aware of potential post-1989 obligations for ETS-registered stands: 1.03 (now 1.05), 5.01, 3.01, 2.03, 7.02, 8.02.
- All *Pinus radiata* stands should be managed with a transitional forestry approach for active conversion to permanent forest tree cover.
- Options for alternate funding for forest transition, including partnership with Tane's Tree Trust, need to be explored.
- Options for community participation in forest transition, especially recreational, trapping and conservation groups, and specialist timber interests need to be explored.

Roding Catchment stand-by-stand assessment

Note: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	**Area (ha)**	**Species**	**Year planted / established**	**Continue Plantation Harvests**	**Alternate timber species (exotic & indigenous)**	**Mixed exotic & indigenous amenity forest**	**Native forest via natural regeneration or replanting**
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇							
RODI 56.01	17.8	P Rad	1993**	✓✓	✓✓✓	✓	✓
RODI 55.01	7.58	P Rad	1993**	✓✓	✓✓✓	✓	✓
RODI 55.02	1.13	P Rad	1988**	✓	✓✓✓	✓✓	✓
RODI 55.03	4.42	Acacia mel			✓✓✓	✓	✓✓
RODI 56.01	17.8	P Rad	1993**	✓✓	✓✓✓	✓	✓
5 stands	**48.73 ha**						
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇							
RODI 54.02	9.57	P Rad	2003	✓✓✓		✓	✓✓
RODI 55.04	0.83	P Rad	1990	✓	✓✓	✓	✓✓✓
RODI 56.05	2.6	P Rad	2006	✓✓	✓✓✓	✓	✓
RODI 56.06	0. 77	P Rad	1972**				✓✓
4 stands	**13.0 ha**						
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇							
RODI 53.05	38.52	P Rad	2015	✓✓✓	✓✓	✓	✓
RODI 53.06	49.46	P Rad	2018	✓✓	✓✓✓	✓	✓
RODI 53.07	18.45	P Rad	2018	✓✓	✓	✓	✓✓✓
RODI 53.09	45.74	P Rad	2019	✓✓	✓✓✓	✓✓	✓✓✓

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	**Area (ha)**	**Species**	**Year planted / established**	**Continue Plantation Harvests**	**Alternate timber species (exotic & indigenous)**	**Mixed exotic & indigenous amenity forest**	**Native forest via natural regeneration or replanting**
RODI 55.05	18.6	P Rad	2019	✓✓	✓✓✓	✓	✓
RODI 56.07	13.21	P Rad	2010	✓✓	✓✓✓	✓	✓
6 stands	**184 ha**						
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇							
Roding: none							
15 stands	**~ 245.71 ha in Roding Catchment**						

Roding forest block observations and preferences

1. Because we are recommending that front-facing forests (i.e. those with a nearby city backdrop and multiple public uses) should be a priority for change to indigenous (or, in places of suitable climate, soil and access, selected specialised alternative timber species), more distant forests such as the Roding could remain in some plantation forestry, with options to either continue in pine, or convert to alternative timber species potentially trialled in the Maitai and Brook.
2. There is an opportunity for NCC to demonstrate good practice land management to deliver its water-quality and river-management objectives as a regional council, and to demonstrate what can be achieved with a mosaic approach to steepland management. For example, NCC alongside TDC who are already doing this with Kingsland Forest, could advocate for contiguous forest mosaics, and be a New Zealand leader in trialling specialised alternative timber species for local use (e.g. with groups like the Fine Wood Working group at Cable Bay and Appleton's Tree Nursery). Wider indigenous riparian buffers are needed along the Roding River and in tributary gullies, especially above the Roding water supply intake
3. There is potential for increased recreational use of the Roding forest as an access route to the Te Araroa Trail and to the historic mining sites upstream
4. Some stands are too large to be harvested all at once (e.g. a complete tributary may be cleared once it has been subdivided, where practical, to reduce risk of sedimentation especially above the Roding water supply weir and intake).
5. An overall vision for the Roding forest in the longer term is, therefore, to progress towards is one with indigenous-forested fire-resistent gullies, wider indigenous riparian margins especially above the water supply, alternative mixed timber species in the lower more accessible stands, continued pine forest to the end of current rotations (when decisions on future land cover could be

reviewed), regeneration of indigenous bush along the current indigenous forest margins, and replanting of indigenous species in the currently grass-reverting-to-gorse limestone band towards Mt Malita. This vision is supported by the now high-quality roading infrastructure for future access throughout the block, and the potential for necessary weed and pest control to be led by a NCC/TDC Roding catchment group that covers the wider catchment, including wilding eradication in the adjacent lands.

6. These recommendations reduce the areas proposed for continued pine forestry in the Catalyst, Bell and Landvision reviews because of the need for improved riparian protection and reduced fire risk (in the face of more climate extremes) and the opportunities for alternative timber and amenity species.
7. Overall, the Roding forest suits continued pine forestry with smaller harvest sizes, greater riparian protection, especially in all tributaries above the Roding water supply intake and along the river. Lower accessible slopes would suit alternate timber mixes for selective or coupe harvesting, while upper parts of the forest that are more vulnerable to windthrow could be harvested, and then allowed to revert to indigenous from nearby indigenous forest seed sources.

Marsden Catchment stand-by-stand assessment

NOTE: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇️							
MARS 41.	0.9	Wilding	**				✓✓✓
MARS 42.05*	29.76	P radiata	0**		✓✓✓	✓✓✓	✓✓✓
MARS 42.07	~ 5 ha of 51.03	Was P radiata	0**		✓✓✓	✓✓	✓
MARS 42.13	0.45	P radiata	1994**		✓✓✓	✓✓✓	✓✓✓
MARS 44.01	0.49	Douglas fir	1976**			✓✓	✓✓✓
5 stands	36.6 ha						
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇️							
MARS 42.06*	21.23	Douglas fir	1997	✓✓✓	✓✓✓		
MARS 42.07	~46 ha of 51.03	Was P radiata	1997		✓✓✓	✓✓	✓
MARS 42.08*	6.26	Macrocarpa	1997		✓✓✓	✓✓✓	✓✓✓
MARS 42.10	6.4	P radiata	2007		✓✓✓	✓✓✓	
4 stands	79.89 ha						
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇️							
MARS 42.11	28	P radiata	2014		✓✓✓	✓✓✓	✓✓✓
1 stands	28 ha						
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇️							

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
0 stands	0 ha						
9-10 stands	144.49 ha in Marsden Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring						

Marsden forest block observations and preferences

There are several stand out issues in this forest area:

1. About 40% of the catchment of Poorman Stream and 100% of Orphanage Stream originate in this block. The original reason for cutting trees, apparently, was that there had been a windfall. One lower gully was not harvested despite there being a skidsite adjacent to it. This gully then slipped into the neighbour below, filling that gully in spoil and trees up to 10 m deep. The weir near the bottom seems to have halted the flow of debris owing to a log jam forming there. This leaves a situation where the gully is now full and the next time this happens, the spoil and trees will flow downstream to the next choke point among Stoke housing. It would seem NCC is liable for land it owns slipping onto private land. Task Force members have personal experience with this type of slipping/flooding and express great concern, especially since a month ago we also clear-felled more of the forest that feeds into this gully.
2. Given these risk priority should be given to riparian plantings on the steep gully section of stand 42.05 in the Marsden catchment below Glider Road. It is at high risk of erosion, with the sediment potentially entering Poorman Stream (see Appendix 4A, supplementary recommendations, and 4C, Marsden Catchment review).
3. The Douglas fir stand, 42.06 of 21.23 ha. has previously been recommended for removal because of its wilding pine risks. The TFs ‘halt all harvesting’ recommendation, aimed at stopping further increases in the area of bare land requiring transition planting , has delayed that. It is now concluded that the wilding risk is low (based on earlier detailed assessments) and a lesser risk that clearing the D fir now. Transition at a later date when the stand has commercial value is recommended.
4. The numbers of deer and possums are exceptional in the Marsden forest owing to the farmland, which provides feed for both, allowing a high resident population. Animals will eat things they normally would not under two situations: when they are very hungry; when they are bored. NCC must not underestimate the latter. Shooting and poisoning are good ways to reduce populations but they are temporary, not long-term, solution.
5. Council own or have control of the entire catchment of Poormans Stream and Orphanage Stream right to the sea, yet these streams are the catchment’s most degraded streams. There is no reason this needs to continue other than lack of will.
6. Fire must also be taken into account when planning; and risk of fire mitigated.

Brook Catchment stand-by-stand assessment

Note: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)				**Assessment against scenarios (all of which produce tall canopy forests)**			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇							
BROO 22.05	2.03	Was P radiata	1987**			✓✓	✓✓✓
BROO 22.06	3.38	P radiata	1988**				✓✓✓
BROO 22.08	3.37	Was D fir	1981**			✓✓	✓✓✓
BROO 22.12	1.9	Was P radiata	1988**			✓✓	✓✓✓
BROO 25.01	2.98	Macrocarpa	1994**				✓✓✓
BROO 28.01	3.87	P radiata	1993**			✓✓	✓✓✓
6 stands	**17.53 ha**						
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇							
BROO 22.04	.25	P radiata	1983			✓✓	✓✓✓
BROO 22.09	10.04	P radiata	2011			✓✓	✓✓✓
BROO 29.01	9.49	P radiata	2013			✓✓	✓✓✓
BROO 29.02	33.91	P radiata	2014			✓✓	✓✓✓
4 stands	**53.69 ha**						

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇							
BROO 26.01	1.61	Macrocarpa	1994			✓✓	✓✓✓
BROO 26.02	3.45	P radiata	1987			✓✓	✓✓✓
BROO 26.04	.23	Eucalypt	1998			✓✓✓	✓✓
BROO 26.05	19.92	P radiata	2009			✓✓	✓✓✓
BROO 26.06	10.05	P radiata	2010			✓✓	✓✓✓
BROO 26.07	.45	P radiata	2012			✓✓	✓✓✓
6 stands	**35.71 ha**						
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇							
BROO 21.02	22.02	Indigenous (was P radiata)	2019/20 (P radiata harvested 2016)				✓✓✓
BROO 21.03	0.23	Douglas Fir	1986			✓✓✓	✓✓✓
BROO 21.05	1.93	Mixed	1960			✓✓✓	✓✓✓
BROO 21.11	1.22	Redwood	1934			✓✓✓	✓✓
BROO 22.02	3.3	Was P radiata	1981**				✓✓✓
BROO 22.10	14.74	Was P radiata	NA				✓✓✓
BROO 22.11	5.8	Douglas fir	1983				✓✓✓

Stand information per master list / 2023 Maps (PFO)				Assessment against scenarios (all of which produce tall canopy forests)			
Stand Number	Area (ha)	Species	Year planted / established	Continue Plantation Harvests	Alternate timber species (exotic & indigenous)	Mixed exotic & indigenous amenity forest	Native forest via natural regeneration or replanting
BROO 29.04	15.97	Was P radiata, now indigenous	2014				✓✓✓
8 stands	**65.21 ha**						
24 stands	**~172.14 ha in Brook Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring**						

Brook forest block observations and preferences

The entire Brook forestry estate is urban fringe. The catchment has very high biodiversity, and high recreational, amenity and tourism economic value, currently with a c. $50m/year economic impact and $30-40m/year unrealised potential. There are known risks from production forestry with the potential to impact homes, schools, roading and access to key water infrastructure. All stands within the Brook catchment should be transitioned away from clear-felling, prioritising recreational and biodiversity outcomes from today, with particular emphasis on track and trail planning (create easier-grade trails and separate-use trails where possible), and on planting indigenous emergent and seed species, to support habitat enhancement for birdlife from the Brook Waimarama Sanctuary.

Key observations and preferences for the Brook Catchment:

- All areas should be actively managed for pest and weed control, including wilding pines which are already an issue in some transitioned areas.
- NCC needs to take action to avoid pre-1990 land liability risk for BROO 22.02.
- Stands of *Pinus radiata* need to be managed with a transitional forestry approach for active conversion within 10 years to permanent forest tree cover, prioritising recreational access, biodiversity outcomes, nature-based resilience. The relevant stands are: BROO 22.04, 22.09, 29.01, 29.02.
- No stands are eligible for post-1989 ETS credits, but NCC should explore options for alternative revenue sources to support transition and ongoing forest estate management, e.g. honey production leases, voluntary carbon and biodiversity credits, external grant and co-funding.
- NCC needs to explore options for community participation in forest transition, especially recreational, trapping and conservation groups; possibility for ‘global forest’ for former refugee and migrant communities involved in planning, design, species selection, planting and maintenance. BROO 28.01 or another suitable and accessible area could be the focus.

Appendices

Appendix 1

Right Tree Right Place Task Force – Terms of Reference – Purpose & Role

Nelson City Council
Right Tree Right Place Task Force
Terms of Reference

1. Purpose

The purpose of the Right Tree Right Place Task Force is to:

- become conversant with the current objectives of Nelson Council-owned land currently managed for production forestry including recently harvested areas taking into account the wider goals and functions of the Council.
- draw on the high-level forestry review reports, other relevant research data and stakeholder views to provide recommendations for future land use and management of Council-owned land currently managed for production forestry.

The Task Force will report to Council and was established by Council resolution at its meeting of 09 February 2023.

The Task Force terms of reference and membership were adopted by Council resolution at its meeting of 09 March 2023.

2. Role of the Task Force

The role of the Task Force is to review technical advice and consider stakeholder views such that well-informed decisions can be made to provide clear direction on how forestry areas are to be used and managed while considering:

- a range of climate change and adaptation matters
- conservation benefits
- the financial implications and opportunities for Council and the Nelson-Tasman economy
- recreational benefits for a variety of users such as walkers and mountain bikers
- meeting national and regional regulations and guidelines associated with exotic forestry, particularly around the spread of wilding pines
- effects on Nelson's biodiversity
- landscape and aesthetic benefit from a backdrop of permanent indigenous forestry or amenity land cover compared to short rotation commercial forests
- social license to undertake production forestry in urban fringe

Appendix 2

Transition planning – recommendations submitted August 7, 2023

1. That until the NCC has a plan, process, and resources in place to transition existing and future (cutover) vacant land, that P F Olsen Ltd be directed to halt all harvesting in the Marsden Block (D.fir and P. radiata) effective immediately.
2. Further to recommendation one, that harvesting be halted in all other areas until Task Force recommendations are received by council.
3. That NCC actively manage existing areas that are awaiting harvest transition plans, to ensure that current and future weed infestations are halted, to allow replanting (or regeneration) to occur as soon as is possible after the NCC has made its decision to do so.
4. That any stands that are within two years of triggering the Pre-1990 liabilities be considered immediate priorities for transition re-establishment in 2024.
5. That the NCC invest in having their forests valued in 2023, by stand, and confirm the decision processes for actioning harvests.

Note: These recommendations were submitted to NCC Chief Executive on August 7, 2023, and subsequently actioned.

Appendix 2A

Supplementary to transition planning recommendations above

Following further field visits on August 31 and September 18 the Task Force (Task Force) agreed on September 19 that additional urgent action is needed to manage riparian and cleared land in several catchments, involving weed and wilding pine control plus planting preparation in riparian areas.

These recommendations follow on from those of August 7 and aim to ensure that currently cleared areas, in all catchments, have continuity of critical transition actions this summer.

This Supplementary set of Recommendations were in two parts:

Part I - Recommendations

Part II - Details for affected areas.

Part I – Recommendations (of Supplementary set)

It is recommended that:

1. There be an immediate commitment to weed and wilding pine control on all existing harvested land that is already showing infestation. All work to be funded from the commercial forestry cost centre/account.

   Note: To action recommendation one, attached is a schedule of work for weed control and costings provided by PF Olsen Ltd. to occur over the 2023-24 summer.

2. All riparian zones on land harvested in the last five years are identified to a planned distance from the water edge (Note a) and preparation for planting (e.g. weed control, species selection, ordering, planting plan etc.) be actioned as soon as possible with the objective they be planted in winter 2024.

   Note a: Distance to be geography dependent but as extensive as possible for slopes directly connecting to a water supply watercourse.

   Note b: Irrespective of the actions taken as a result of the final Task Force recommendations the Task Force believe that any delay to the works required in existing and potential riparian land will negatively affect the achievement of desired downstream values, environmental and regulatory outcomes and increase the costs of doing so.

3. There be an immediate start made to planning for any desired walking or mountain bike tracks on the cleared areas in all catchments.

   Note: This assumes ongoing inout from relevant community walking biking and similar groups. This would ensure that all track building is actioned before widespread planting in 2025/26 – thus facilitating the choice of species planted adjacent to tracks and the tracks providing access for planting (per Silvan and Kingsland forests approach).

4. No additional forestry roading (new or maintenance) be commissioned until the future use/s of all commercial forestry stands has been agreed.

   Note: A key reason for this recommendation is to ensure any new roading is designed and located to meet a wider range of values - including landscape (visibility) particularly on areas facing Nelson city and suburbs.

Part II - Details of affected areas

The proposed works include:

Weed control

The following work schedule and costings was supplied by PF Olsen Ltd following a request from the Task Force for treatment specified and stands identified.

Forest	Stand(s)	Clearfell date	Area	Treatment	Timing	Comments	Cost $/ha	Total Cost + GST
Maitai	3/02, 3/04	May '22	11.5	Spot Spray	Spring '23, Autumn '24	Area adjacent to Fiddler's elbow and Matai river	$ 1,380	$ 15,870
Maitai	2/01,2/03, 3/01, 3/03, 4/05, 4/07,4/11	Oct '21 to Aug '22	50.8	Helicopter	Spring '23, Autumn '24	Main cutover area above pipeline.	$ 1,300	$ 66,014
Marsden	42/05	Jan '22	8.0	Spot Spray	Spring '23, Autumn '24	Main cutover gully below Glider Rd and up against farm boundary.	$ 1,380	$ 11,040
Marsden	42/05, 42/07	Jan '22 & Aug '22	19.0	Helicopter	Spring '23, Autumn '24	Excludes area logged in 2023	$ 1,300	$ 24,700
								$ 117,624
NB: Costs include planning, recreation closures/pedestrian management, chemical, labour/helicopter, GIS and operational record keeping.								

Note: Areas tagged for spot spraying are riparian and should be planted as soon as possible (winter 2024) Missing in the above is part of Sid 9.02 which should also be treated.

Riparian intervention

These actions are aimed to better establish long-term riparian margins as follows:

The Maitai:

- Stand 9.02 adjacent to the Maitai dam (regenerated in 2019) just upstream of the water supply intake, now has a significant gorse infestation.
- We recommend that the pine trees be removed and the gorse treated where necessary (protecting existing indigenous regeneration, if present, in these areas) to allow planting of acceptable indigenous species to provide riparian benefits (i.e. protect dam and Maitai waters from siltation) while still meeting the requirements of pre 1990 forest land re-establishment before the existing P*. radiata* are any taller.
- There are also several other stands in the Maitai (including 3/02 and 3/04) where additional riparian enhancements/establishment should be further investigated.

The Roding:

- For stands 53/09 and 55/05 (planted in 2019) there is an opportunity to extend the riparian strip from the minimum required to a suitable width (i.e to the toe of the slope where practical) for the long-term enhancement of the catchment while the crop is young.
- This would allow removal of pines with some of the area replanted in a suitable species mix and others left to regenerate (but any left should be less than 1 ha so that if there is not regeneration, pre-1990 land liabilities will be avoided). The aim of this approach is to see if natural indigenous regeneration is possible in this area.
- There are also wilding pines in the riparian area below stand 56/05 that could be easily removed before growing larger and becoming more problematic.

Note: Up to 70% pine removal (retaining 30% canopy) is possible, without triggering pre-1990 deforestation. The remaining 30% pine can be removed in future when restoration planting has reached the required density and height.

The Marsden:

- The spot spraying referred to in the above Weed control table is for part of stand 42/05 located below the access road and on the opposite face up to the farmland boundary. It is a steep valley.
- With some severe weed and wilding *P. radiata* infestation, a potential for erosion and part of the very visible landscape facing urban Stoke.
- The aim of spot spraying is to avoid a blanket vegetation kill in parts that have some indigenous revegetation and provide opportunity to plant this area over the next 8–9 months to beat the weeds that will remain between the spots.

Riparian planting advice

- The Task Force is aware there are a number of organisations providing landscape design and planting services. Task Force field visits, review of the expanding large scale forest transition experiences, and discussion with technical experts at our technical evening indicates relatively few organisations have extensive experience in both the production of species, and planting design, for steep hill land, riparian and landscape transitions.
- One local company, Appleton's Nurseries now led by Robert Appleton, has provided extensive advice to both the Silvan Forest Park development and TDC's current Kingsland project. These are both large scale projects with all the same 'what tree where' challenges NCC now faces with needed riparian plantings and shortly large landscape plantings. Task Force members have discussed a wide range of species selection and planting matters with Robert Appleton and nursery founder Eric Appleton. One of the most notable of their concerns was the excessive planting rates being used in many restoration projects and how few canopy (tall forest) species were being planted, for example as seed trees.
- We would recommend Appleton's (or people with similar local practical experience) as a starting point for planning winter 2024 riparian plantings.

Note: These recommendations were submitted to the NCC Chief Executive on 28 September 2023 and are awaiting action.

Appendix 3
System reviews

1. The Value of NCC's Forest Estate (link)
2. Strategic Planning and Decision Making (link)
3. Enhancing Forest Stewardship – governance and community opportunities (link)
4. Evolving Ecologies – community aspirations, forests transition options and challenges (link)

Appendix 4
Catchment reviews

A. Maitai - (link)

B. Brook - (link)

C. Marsden - (link)

D. Roding - (link)

Appendix 5

Cost Table – next page

Appendix 5 – Cost Table – Range of costs associated with planting + pre- and post-planting, various tree types

	Species	Pine			Redwood			Cypress			Indigenous		
	Amounts are estimates based on best available information for 2023. Actuals will vary with cost increases in various categories, sph, canopy closure rates, etc.	Low	Avg (not necessarily arithmetical)	High	Low	Avg (not necessarily arithmetical)	High	Low	Avg (not necessarily arithmetical)	High	Low	Avg (not necessarily arithmetical)	High
a	Cost per tree: ($)	0.45	0.45	0.45	1.5	2.5	3.5	2	2.5	3	3	4.5	6
b	Stems per hectare (sph):	800	1,100	1500	833	833	625	833	833	833	1000	1100	4,444*
c	Cost of trees stock, planting & mgmt fee per hectare at given sph ($)	1,152	1,584	2,160	2,249	3,249	3,188	2,749	3,249	3,749	5,220	7,722	39,196**
d	Spraying costs – (chemicals included), application costs/tree (depends on height) ($)	0.4	1.2	2	0.4	1.2	2	0.4	1.2	2	0.4	1.2	2
	pre-plant spraying costs per ha/spray	450	450	450	450	450	450	450	450	450	450	450	450
	recommended number of sprays	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	cost of recommended spraying/ha	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125
e	Sleeves/protectors; (Based on sph) (per sleeve) ($) (incl stakes)	3	4.5	6	3	4.5	6	3	4.5	6	3	4.5	6
f	Cost of sleeves per hectare (col b x col e)	2,400	4,950	9,000	2,499	3,749	3,750	2,499	3,749	4,998	3,000	4,950	26,664
g	Application of sleeves/protectors; (Based on sph per sleeve labour cost) (a factor of: steepness, gorse overgrowth, access) hrly rate per ha (@ $80/hr and x hrs/ha) (assumes	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
h	cost of applying sleeves (col b x g)	n/a	n/a	n/a	1108	1108	831	1108	1108	1108	1330	1463	5911
	total costs per hectare												
	tree stock and planting	1,152	1,584	2,160	2,249	3,249	3,188	2,749	3,249	3,749	5,220	7,722	39,196
	spraying - two sprays prior only	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125
	sleeves/stakes/labor applied (f+h)	n/a	n/a	n/a	3,607	4,856	4,581	3,607	4,856	6,106	4,330	6,413	32,575
	total costs per hectare - pre-plant and planting	2,277	2,709	3,285	6,981	9,230	8,894	7,481	9,230	10,979	10,675	15,260	72,896
	post-planting release spray (aerial for pines)	450	450	450	666	666	500	666	666	666	800	880	3,555
	post-plant spraying (assumes spot release spray)				666	666	500	666	666	666	800	880	3,555
	on-going maintenance (spraying, etc.) not shown				666	666	500	666	666	666	800	880	3,555
	total/hectare (pre-plant, plant, post-plant 3yrs)	2,727	3,159	3,735	8,980	11,229	10,394	9,480	11,229	12,979	13,075	17,900	83,561

* using NCC's planting rate

** per A. Forbes (2021) planting costs for indigenous range from $1,250 to $21,717 per ha

High shows extremes of situations; very steep, arduous conditions, maximum sph, high cost of tree stock, etc. – total is largely a function of stems per hectare

The Value of the NCC Forest Estate

Lead author: Stuart Orme
Co-authors: Matthew Benge & Andrew Fenemor

Executive Summary

Early in the Task Force's investigations, we were advised that Nelson City Council (NCC) expected to generate less than a 1% return on its investment over a 27-year period of commercial forest activities.[1] Despite this poor fiscal picture, the Task Force believes that NCC has a potentially very valuable total forest resource – one that encompasses the 10,000+ ha of indigenous forest as well as the small commercial estate.

However, the Task Force concludes that NCC has, to date, missed an opportunity to maximise the many values the forests provide to the Nelson community.

Given the apparent environmental and pest-related degradation of the total 10,000+ ha estate, the potential to improve carbon sequestration and biodiversity seems immense, with some quick gains possible and long-term improvements attainable.

Recommendations

1. The Task Force **recommends** further investigation of the compliance (Emission Trading Scheme; ETS) carbon offsets from post-1989 forested land, the voluntary carbon, biodiversity credit, and the other opportunities potentially available from the balance of the exotic and indigenous estate as it existed before 1990, and that a policy be adopted that best identifies and uses these opportunities.

- With this would come other fiscal opportunities from forest users by way of concessions, the apiary industry and others.
- PF Olsen Limited (PFO) currently manages, values and harvests NCC commercial forests. In its June 2023 valuation, PFO chose to value 39 stands capable of making a positive harvest return. Of those 39 stands, only 26 are over 3 ha in size. These stands are valued at $4,023,000.
- The size of the NCC budget to support these few commercial stands seems disproportionate to the financial value that appears to be expected. The Task Force therefore believes it is timely to review this situation, given all the other values that the community wants and which NCC's total forest estate is able to provide -- if invested into correctly.

2. We **recommend** that NCC sell identified cutting rights to selected stands for one rotation, inclusive of conditions relating to: ongoing public access, forest management, harvesting, time frames and hand-back, and funds received are reinvested in the forest transitions recommended in the Task Force's Report.

- To facilitate the sale of its standing crop, NCC will need to use an experienced forest sale agent to work with PFO and others to determine appropriate forest stands for sale and to determine what the hand-back (after harvest time frames) might look like.
- From these determinations, a reputable plan, timetable and budget with attainable key performance indicators (KPIs) can be quickly developed.

[1] Refer to the forestry financials spreadsheet, 2004–2031, accessed 28 Oct 2023.

ETS Credits

In May 2023, NCC received 14,453 NZU (of which 8784 require surrender if all trees are felled), with a current total value of $1,011,710 (at a 19 Oct 2023 price of $70/NZU).

3. We **recommend** that these forestry credits, and all future carbon, voluntary carbon, biodiversity credits, and other revenue streams from the forest lands should be ring-fenced for any future forest harvest liabilities and to fund the forest transition, community well-being within forest, and forest estate restoration.

Potential Savings?

It is estimated that the following items could free up more than $6m for reinvestment into NCC forests and underlying land:

Money currently in the Forestry Account (Oct 2023)	$ -32,000
Sale of cutting rights (commercial stands)	$ 4,022,900
Management cost savings over the next 10 years	$ 2,000,000
Value of unobligated carbon in NCC account	$ 396,830 (at $70/NZU)
Total	**$6,387,730**

It is also anticipated that further income from un-obligated carbon, concessions and specific-project finance may become available once NCC has a proven track record in carrying out and sustaining an active forest transition programme.

Introduction

This is one of four reviews that provide the framework for decision making across the entire 10,000+ Nelson City Council (NCC) forest estate and within the four areas containing commercial forests: the Maitai, Brook, Marsden and Roding. They provide the horsepower on the 'whats', 'whys' and current best 'hows' for the entire forest estate, while our other (separate) reviews profile the four catchment areas and identify key opportunities and risks, and note specific stands where transitions are needed.

This review also looks at the potential fiscal value of the estate and NCC's ability to realise that potential.

Description of the forest estate

The NCC exotic estate is scattered and variable. The Task Force has identified 326 separate land areas that at some stage have been mapped as part of NCC's forest estate. From these, 83 stands have been identified as containing exotic trees or are part of the 'transition' programme that was started in 2016. It is these 83 stands that the Task Force is reviewing and making recommendations on.

Of these:

- 44 are established in *Pinus radiata*
- 6 are in Douglas fir
- 4 are in macrocarpa

- 2 are in *Acacia melanoxylon* (one of which has been sprayed out but are regenerating)
- 2 are in eucalyptus
- 1 is noted as mixed exotics
- the balance (some 24 stands) is potentially in some form of full, partial or failed indigenous transition.

In its June 2023 valuation, PFO chose to value only 39 stands capable of making a positive harvest return. Of those 39 stands only 26 are over 3 ha in size.

Forest value

The following should be read in conjunction with the NCC Tree Crop Valuation – Reporting Period: June 2023.[2]

The NCC forest valuation completed by PFO notes the value of the forest to be $4,105,000 after the costs of a potential sale are deducted (p4).

It follows both the NZIF valuation standards and the International Accounting standard 41 Agriculture, NZ IAS 41, issued by the NZ Accounting Standards Board, when costs to sell are deducted from the Tree Crop value (p4).

The Task Force believes that other than the following comments, the valuation is fit for purpose.

- Compartment 1/01, being 10.3 ha of *Pinus radiata* (established 1981), is valued at 'zero' dollars with an expected harvest cost of -$150,856. It was valued at $458,881 in the 2022 valuation (and $441,000 in the 2021) but we understand that perceived council and community requirements have meant PFO believe it to be uneconomic to harvest. We believe this should be further explored.
- Compartment 42/06, being 21.2 ha of Dougal fir, is valued at a liquidation value (as if cut imminently), as opposed to if it was left to grow to a mature value and that value discounted back; if revalued, the Task Force believes it would have a higher 'current tree crop value'.
- Compartment 42/11 appears not to have a value attached to it this year; this may be an oversight but that needs to be confirmed.
- The valuation incorrectly states that NCC "has now deregistered from the Emission Trading Scheme." And that the valuation "therefore does not include any value in respect of carbon trading".

  This is incorrect as PFO reregistered NCC post 89 forests in 2022 however this oversight has no material implications on the recommendations in this paper.

The following table outlines the changing values by stand between PFO's 2020 and 2023 valuations. Note that some changes are due to full or partial harvest, but most are due to changing costs and revenue profiles.

[2] NCC Tree Crop Valuation, PF Olsen, 2023 -- https://drive.google.com/file/d/1fxENLIXMbq3nlCimAksxcpBb1w-0cHxK/view?usp=drive_link

Forest	Stand	Planted Year	Market value 2020 Total ($)	Market value 2021 Total ($)	Market value Total ($) 2022	Market value 2023	Difference between the 2022 & 2023
BROO	0022-04	1983	5,037	5,577	4,753	3,270	-1,483
BROO	0022-05	1987	47,199	52,312		Felled	
BROO	0022-06	1988	83,088	95,266		Felled	
	22.08					Felled	
	22.02					Felled	
BROO	0022-09	2011	43,431	38,333	70,506	44,753	-25,753
BROO	0026-01	1994	8,622	9,637	11,910	14,456	2,546
BROO	0026-02	1987	54,827	61,319	64,521	52,398	-12,123
BROO	0026-05	2009	122,704	102,398	176,127	181,337	5,210
BROO	0026-06	2010	56,452	45,088	81,091	83,351	2,260
BROO	0026-07	2012	1,923	1,167	2,884	1,821	-1,063
BROO	0028-01	1993	80,356	81,642	107,266	-105,974	-213,240
BROO	0029-01	2013	35,735	18,826	57,297	39,840	-17,457
BROO	0029-02	2014	102,340	56,270	123,201	116,346	-6,855
MAIT	0001-01	1981	386,662	447,945	458,881	-150,856	-609,737
MAIT	0001-05	2020	15,871	18,421	23,987	29,673	5,686
MAIT	0002-01	1981	4,622	5,399		Felled	
MAIT	0002-03	1995	97,020	100,968		Felled	
MAIT	0002-04	2011	56,620	47,510	31,766	67,412	
MAIT	0003-01	1982	24,612	30,266		Felled	
MAIT	0003-02	1986	56,292	62,947	37,086	Felled	
MAIT	0003-03	1988	100,944	119,629		Felled	
MAIT	0003-04	1995	222,158	241,252	40,818	28,229	-12,589
MAIT	0003-05	2011	37,007			43,853	43,853
MAIT	0004-03	1983	17,965	19,508		Felled	
	0004-04					-3,174	-3,174
MAIT	0004-05	1988	505,603	576,548		Felled	
MAIT	0004-07	1996	15,296			Felled	
MAIT	0004-11	1995	556,628	604,383	436,069	Felled	
MAIT	0004-12	1993	17,015	18,129	23,226	-1,385	-24,611
MAIT	0004-14	2009	5,977	4,725	7,132	0	-7,132
MAIT	0004-15	2018	18,620	16,964	19,754	24,560	4,806
MAIT	0004-16	2020	2,490	2,890	3,731	4,616	885
MAIT	0005-01	1995	25,395	27,131	36,374	-5,328	-41,702
MAIT	0005-02	1992	2,662	3,221	4,989	-570	-5,559
MAIT	0007-02	1993	37,466	38,125	44,935	23,061	-21,874
MAIT	0008-02	1991	126,127	132,203	154,796	71,563	-83,233
MAIT	0009-05	2018	32,933	30,004	36,604	45,508	8,904
MAIT	0009-07	2018	1,267	1,154	1,452	1,806	354
MAIT	0010-02	1992	71,635	74,161	88,221	54,373	-33,848
MARS	0042-05	1994	1,056,622	1,134,295	300,813	281,422	-19,391
Mars	0042-06	1997			34,825	89,309	54,484
MARS	0042-07	1997	1,580,236	1,665,809	1,785,929	1,522,404	-263,525
MARS	0042-08	1997	22,009	22,218	17,451	61,576	44,125
MARS	0042-10	2007	38,351	31,410	37,843	36,624	-1,219
MARS	0042-11	2014	50,968	47,002	52,556	0	-52,556
RODI	0051-02	1991	5,551	6,023	6,177	6,531	354
RODI	0053-05	2015	118,280	58,905	108,299	120,616	12,317
RODI	0053-06	2018	100,635	57,123	70,603	86,703	16,100
RODI	0053-07	2018	37,611	21,349	26,337	32,345	6,008
RODI	0053-09	2019	79,082	46,980	59,188	77,056	17,868
RODI	0054-02	2003	56,609	51,015	65,629	86,808	21,179
RODI	0055-01	1993	199,940	223,794	229,866	148,648	-81,218
RODI	0055-02	1988	21,899	23,757	26,374	27,405	1,031
RODI	0055-04	1990	26,309	28,807	33,531	33,371	-160
RODI	0055-05	2019	32,013	19,018	23,913	29,853	5,940
RODI	0056-01	1993	503,219	558,180	579,902	352,640	-227,262
RODI	0056-05	2006	23,837	22,157	27,499	33,855	6,356
RODI	0056-07	2010	81,604	68,581	99,265	114,447	15,182
TOTAL ESTATE MARKET			**$ 7,115,373**	**$ 7,326,336**	**$ 5,846,259**	**$ 4,104,803**	

The right-hand column compares the value changes between 2022 and 2023 with the latter valuing per stand, as opposed to a 'forest' approach previously adopted.

The sum of $4,104,803 is an amalgam of the positive stumpages only in the 2023 valuation.

The negative numbers are the estimate that PFO believe is required to pay for the removal of these stands if they are felled under the market conditions that valuation assumes.

The 'felled' stands are all on either pre-1990 or post-1989 forest land and must be replanted to meet the vegetation growth and stocking requirements before 4 years after harvest was started on them to avoid Pre 1990 liabilities or post-89 obligations.

The difference between the post-89 forest and pre-90 land to NCC is that not achieving the post-1989 obligations means the loss of future NZU earnings as the land would need to be withdrawn from the scheme, but for the pre-1990 liabilities there are significant costs, the major one being the appropriate surrender of the required NZU (circa 694/ha) plus a $30 fine per unit at a forest age of 30 years if the NZUs are not surrendered on time.

Assuming a $70 NZU price, this amounts to

($70 + $30) x 694 or $69,400/ha.

Projected values compared to what was achieved

The NCC commissions a forest valuation annually. Forest valuations follow a recognised industry protocol and provide a value of the forest asset for NCC. It is important to note that these valuations form the basis for making short-, medium- and long-term forest management decisions, including whether to go to market (to sell timber) or not.

These forest valuations should accurately reflect operating costs based on likely market access as well as what the forest's timber will be worth, if cut, when the market aligns with the valuation of log prices.

The Valuation Expectation in the following table is calculated from (a) the June 2021 valuation for the 2022 harvest and from (b) the June 2022 valuation for the 2023 harvest.

We understand that the valuation used the 'average log price' for the preceding 12 months, i.e. the average log price achieved from July 21 to June 22 was applied to generate the expectation of revenue for the 2023 period.

Normally, if the market price is down, a forest owner will become aware of this by comparing the predicted returns from the valuation against what the forest manager is saying the block is likely to deliver, if cut now.

We understand that PFO had advised NCC that log prices were down before starting 2023 harvests, but NCC appears to have chosen to progress with the harvesting anyway, on the understanding that they were already committed (as stated in the 2016 Catalyst report) to transition selected stands and that they were tasked with removing existing forest to make way for that (pers. comm. Peter Gorman).

A reconciliation of harvest revenues for the 2022 and 2023 periods is as follows:

Period Harvested	Area	Valuation Expectation	Stumage achieved	% of Valuation	Volume sold	$/Tonne achieved	Valuation expectation
2022	57.8	$ 1,760,900	$ 779,754	44%	38,375	$ 20.32	$ 45.89
2023	23.5	$ 793,546	$ 445,266	56%	16,870	$ 26.39	$ 47.04
Totals		$ 2,554,446	$ 1,225,020		55,245		

In addition to the above, in the 2022 period, an additional $206,000 was spent to remove uneconomic stands to prepare for the transition.

The $26.39 average log profit achieved (in 2023) is in line with what the NCC was expecting.

Note: In May 2023, PFO stated the expected stumpage for Roding and Marsden blocks to be between $24.50/T and $27.56/T, respectively, versus the budgeted returns of $41.87 and $33.50, respectively, provided the previous month.

The current valuation (undertaken in June 2023, using the previous year average for the 2023 harvest and a 5-year average log price on the balance) indicates that over the life of the current rotation for trees in the ground, the forest could provide circa $15,000,000 of potential revenue for the forest owner, if sales meet the valuation average price and cost expectations. However, when the costs to manage this are added and the revenues discounted back to today at an accepted industry discount rate (7.8%), the June 2023 valuation indicates a pre-tax 'tree crop market value' of a much lower $4,105,000.[3]

Given NCC's recent failure to achieve the valuation average benchmark price, the Task Force has concerns that NCC can realise the predicted values in the valuation going forward.

Projected future income and costs

The following budget extract, with updates from the recent PFO budget and NCC performance (actual figures to date and budgeted figures) indicates that over the next

[3] Tree crop market value is defined in the valuation as the price that could be realised between 'a willing buyer and a willing seller, both well informed, acting prudently, and operating in an arm's length transaction'.

12 years, NCC is required to invest between $2.7m and $3.1m before a positive budget is forthcoming.

Potential NCC Forest finacial Performa	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	Sum of Annual Returns for ten initial ten uewar periods	Extrapolated using latest PFO budget
PFO 22/23-31/32 Budget	$ 1,592,596.99	$ 396,304.02	$ 1,145,039.42	-$ 350,422.04	-$ 177,735.21	-$ 224,828.80	-$ 236,787.82	-$ 232,287.71	$ 55,043.60	-$ 207,985.79	-$ 231,178.48	-$ 435,997.76	$ 1,758,936.67	$1,091,760.42
PFO 24/25 - 2033/34 budget			-$ 1,055,381.75	-$ 306,696.38	-$ 345,184.05	-$ 262,947.66	-$ 229,819.90	-$ 143,983.72	-$ 19,798.38	-$ 164,664.78	-$ 231,178.48	-$ 435,997.76	-$ 3,195,652.87	-$3,195,652.87
NCC Performance position	(142,853)	1,559,726	(591,579)	(489,440)	(456,635)	(561,522)	(512,740)	(434,848)	(217,851)	(164,665)	-$ 231,178.48	-$ 435,997.76	-$1,906,740	-$2,738,581.05

Value comparisons

The potential costs to NCC ratepayers to continue with the current commercial forest arrangements are considerable and hence worth some comparisons.

Assuming the forest is worth $4.1m and Nelson has a population of 55,000, this amounts to circa $74.50 per person.

If we further assume $3m in costs over the next 12 years, this amounts to about $54.50 per person to be paid via rates or loss of funds from the forestry account – just to achieve the status quo and do nothing to improve the wider range of forest lands' values (based on feedback the Task Force received from its public fora and submissions).

Comments on what the community values in their forests, from parties that have interacted with the Task Force, show:

- *Recreational activities*: are frequently and negatively impacted by access closures and damage during clear-felling
- *Cultural and environmental significance*: indigenous areas for cultural practices, clean water supply and inter-generational planning are important
- *Biodiversity and well-being*: emphasis is on supporting indigenous species, and on mental and physical well-being
- *Economic considerations*: substantial economic potential in tourism, recreation (especially mountain biking and paragliding), carbon forestry and timber, whatever forest types are chosen, should be recognised
- *Current model*: many social and environmental risks and costs are 'externalised' (not recognised) by usual and/or standard reports. Options to reduce the risks include limiting the area that is clearcut, using alternative exotic and/or indigenous species, using alternative felling extraction methods, and sales options for timber.

This feedback has been considered by the Task Force in determining its recommendations to transition many stands to long-term (and potentially) continuous-canopy forest.

The following choices emerge, of which one or a combination is applicable. Regardless of the choice(s) made, other funding sources should be identified, such as carbon, voluntary carbon and biodiversity credits, and grant and external co-funding.

1) To progressively manage its way out of the majority of the current commercial forests, while providing significant funding for the agreed transitional plantings and required management from rates

2) To adopt a more fiscally prudent approach to capitalise on the value of the forests, to significantly reduce the next 12 years of negative cashflow, and to then use the accumulated funds to embark on a transition programme
3) To better understand the community 'well-being' value attainable from the forests and actively plan to maximise this.

In its NCC forest valuation, PFO notes in the 'Valuation Approach' (p7),

> *In this estimate of tree crop market value, we assess the price, assuming a willing buyer and willing seller, both well informed, acting prudently, and operating an arm's length transaction.*

It is estimated that aggregating funds in the forestry account (currently in overdraft) with sale proceeds and two-thirds of the management savings could release c. $6,400,000 over the next decade to transition appropriate the forest stands, improve forest access, and invest heavily into improving the overall 10,000+ ha forest estate.

Recommendation

It's important to note that the sale of forest rights is a well-understood and often-undertaken practice in New Zealand, with circa 500,000 ha of former NZ Forest Service forest sold this way in the early 1990s. Since then, many others have taken advantage of this approach, including the Wellington Regional Council, which has similar public demands on its land.

We note in the PFO valuation (under 'Costs to Sell') that the company deducted 2% of the forest's value to allow for costs to do just this.

Based on returns from the forest in the last few years, future costs to be incurred to manage and maintain the forests, and PFO's advice on the value of the forest if sold, we **recommend** that NCC sell identified cutting rights to select stands for one rotation, inclusive of conditions relating to: ongoing public access, forest management, harvesting, time frames and hand-back. All this, to then reinvest in the forest transitions recommended in the Task Force's Report.

There will be some work involved between the selling agent and PFO to prepare the forest for sale but, given the information that PFO hold on behalf of the NCC and its ability to continue to manage the forest(s) for a new owner (sometimes a concern for a forest investor), we believe that the process should be fairly straightforward.

NCC forests and the emissions trading scheme (ETS)

NCC carbon – ongoing management implications

Carbon Forest Services Ltd delivered a report to NCC in April 2021. The report indicated that there was up to 267 ha of post-1989 exotic forest and 27 ha of indigenous vegetation. The Ekos Consulting report (Oct 2022), Forest Carbon Opportunities for Nelson City Council, indicates that there may be an additional 400 ha eligible to go into the ETS within the NCC estate, although this information has not been confirmed by the Task Force.

PFO have since registered all land they felt appropriate, which amounted to 133 ha of exotic and 11 ha of indigenous forest. In May 2023, NCC received 14,453 NZU, with a current value of $1,011,710 (at the 19 Oct 2023 price of $70/NZU).

Recommendation

The Task Force **recommends** that these forestry credits, and all future carbon, voluntary carbon, biodiversity credits and other revenue streams from the forest lands,

should be ring-fenced for any future forest harvest liabilities and to fund the forest transition and forest estate restoration.

The following exotic stands on NCC forest land are registered in the ETS:

Exotic Stands registered in the ETS in 2022

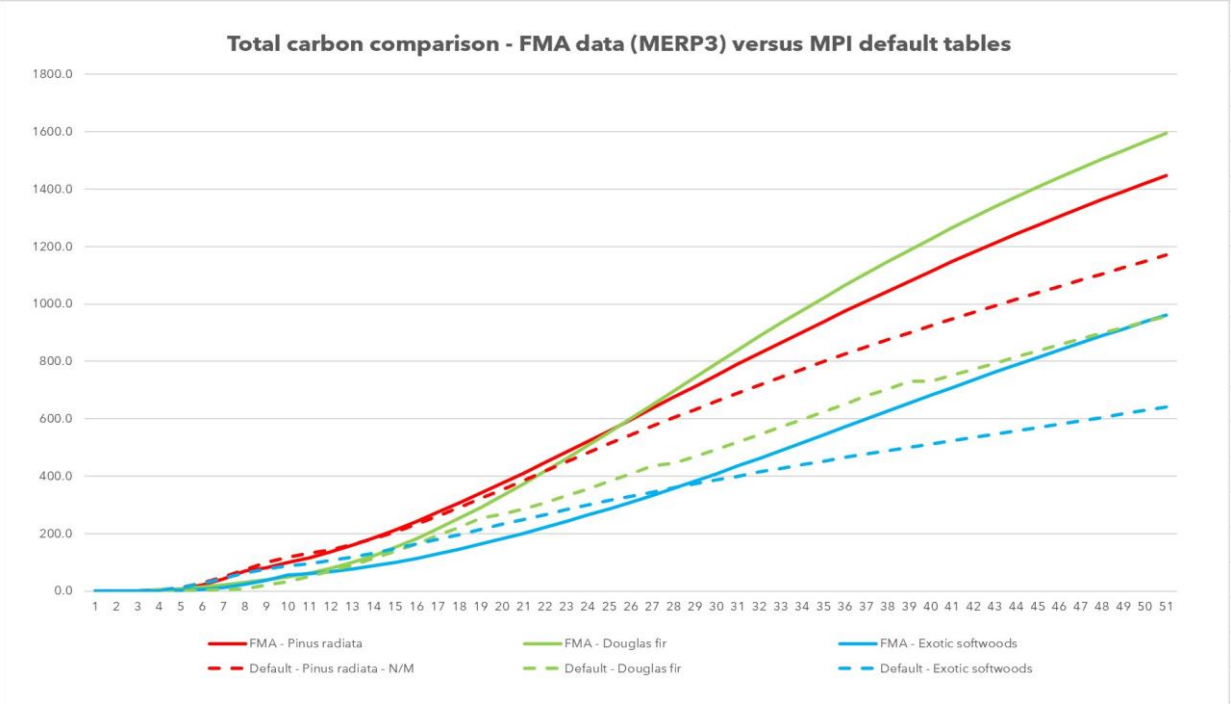
Cpt/Std	MAP number	CAA	Stand number	Block	Region	Area	NSA	Forest Type	Year planted	Rotation	lication nun	Age 1/1/2018	Age 31/12/2022	Carbon accounting	Receive carbon till
42.06	M1	1	15	Marsden	N/M	3.9 ha	21.33	Douglas fir	1997	1	ETSA-050781	21	25	Averaging	2022
D fir	M1	2	14	Marsden	N/M	15.8 ha	-	Douglas fir	1997	1	ETSA-050781	21	25	Averaging	2022
	M1	3	11	Marsden	N/M	1.4 ha	-	Douglas fir	1997	1	ETSA-050781	21	25	Averaging	2022
Cmac	M1	4	2	Marsden	N/M	2.9 ha	-	Other exotic	1997	1	ETSA-050781	21	25	Averaging	2019
	M1	5	17	Marsden	N/M	1.1 ha	-	Other exotic	1997	1	ETSA-050781	21	25	Averaging	2019
42.08	M1	6	16	Marsden	N/M	1.7 ha	6.26	Other exotic	1997	1	ETSA-050781	21	25	Averaging	2019
42.07	M1	7	6	Marsden	N/M	19.6 ha	46.1	Pinus	1997	1	ETSA-050781	21	25	Stock Change	
42.07?	M1	8	5	Marsden	N/M	35 ha	-	Pinus	1997	1	ETSA-050781	21	25	Stock Change	
42.05	M1	9	13	Marsden	N/M	12.2 ha	6.3	Pinus	1994	2	ETSA-050781	24	0	Stock Change	
42.05	M1	10	12	Marsden	N/M	4.9 ha	-	Pinus	1994	2	ETSA-050781	24	0	Stock Change	
42.05	M1	11	7	Marsden	N/M	10.3 ha	-	Pinus	1994	2	ETSA-050781	24	0	Stock Change	
1.03	M2	12	10	Maitai	N/M	10.6 ha	20.38	Pinus	1990	2	ETSA-050781	28	2	Stock Change	
5.01	M3	13	9	Maitai	N/M	3.8 ha	2.26	Pinus	1995	1	ETSA-050781	23	27	Stock Change	
3.01	M4	14	3	Maitai	N/M	1.5 ha	Harvested	Pinus	1995	1	ETSA-050781	23	27	Stock Change	
2.03	M5	15	1	Maitai	N/M	5.4 ha	Harvested	Pinus	1995	1	ETSA-050781	23	27	Stock Change	
7.02	M6	16	4	Maitai	N/M	1.1 ha	0.97	Pinus	1993	1	ETSA-050781	25	29	Stock Change	
8.02	M7	17	8	Maitai	N/M	2.1 ha	3.82	Pinus	1991	1	ETSA-050781	27	31	Stock Change	

Going forward, as stands transition to a potential, continuous-canopy forest, consideration should be given (where appropriate) to changing from 'averaging' to 'permanent' forest category, to reintroduce opportunities to accrue carbon. However, those stands already using 'stock change accounting' should stay as is (i.e. not shift to permanent), because under 'stock change' they receive carbon annually, as if in the permanent category, but are not encumbered with the obligations that 'permanent' necessitates.

Note that there are no material implications to the ETS status and NCC responsibilities if any of the trees are sold to another party.

FMA measurement

Because NCC has more than 100 ha in the ETS, it is required to measure the actual volumes of carbon that the forest sequesters – this process is referred to as the 'field measurement approach' (FMA). When comparing the actual FMA-accrued carbon with the default, the NCC estate is actually generating more carbon stock than the MPI default tables are allocating (see graph below).



The following table outlines the NZUs in the NCC Emission Registry Account that have come from those stands successfully registered back into the ETS in 2022.

Nelson City Council Post-1989 NZUs Registered in 2022

CAA	Stand number	Block	Area	Forest Type	Year planted	Rotation	Carbon accounting	Regulated average age	NZUs for 2018-2022
1	15	Marsden	3.9 ha	Douglas fir	1997	1	Averaging	26	902
2	14	Marsden	15.8 ha	Douglas fir	1997	1	Averaging	26	3656
3	11	Marsden	1.4 ha	Douglas fir	1997	1	Averaging	26	324
4	2	Marsden	2.9 ha	Macrocarpa	1997	1	Averaging	22	60
5	17	Marsden	1.1 ha	Macrocarpa	1997	1	Averaging	22	23
6	16	Marsden	1.7 ha	Macrocarpa	1997	1	Averaging	22	35
									5000
7	6	Marsden	19.6 ha	Radiata	1997	1	Stock Change	n/a	3710
8	5	Marsden	35 ha	Radiata	1997	1	Stock Change	n/a	3731
9	13	Marsden	12.2 ha	Radiata	1994	2	Stock Change	n/a	0
10	12	Marsden	4.9 ha	Radiata	1994	2	Stock Change	n/a	0
11	7	Marsden	10.3 ha	Radiata	1994	2	Stock Change	n/a	0
12	10	Maitai	10.6 ha	Radiata	1990	2	Stock Change	n/a	0
13	9	Maitai	3.8 ha	Radiata	1995	1	Stock Change	n/a	730
14	3	Maitai	1.5 ha	Radiata	1995	1	Stock Change	n/a	0
15	1	Maitai	5.4 ha	Radiata	1995	1	Stock Change	n/a	0
16	4	Maitai	1.1 ha	Radiata	1993	1	Stock Change	n/a	212
17	8	Maitai	2.1 ha	Radiata	1991	1	Stock Change	n/a	401
					Year of regen				8784
18	1	Stoke	1.4	Native regen	2005	n/a	Stock Change	n/a	87
19	3	Stoke	1.6	Native regen	2006	n/a	Stock Change	n/a	97
20	6	Maitai Valley	1.3	Native regen	1994	n/a	Stock Change	n/a	59
21	5	Maitai Valley	5.8	Native regen	2004	n/a	Stock Change	n/a	372
22	2	Maitai Valley	1.0	Native regen	1997	n/a	Stock Change	n/a	54
									669
							Grand total:		14453

Those stands in “Averaging” (i.e. average accounting) will receive no more carbon stock going forward because they have reached their average age. Technically, the 5,000 NZUs that were allocated recently for the 2018–2022 compliance period (CP3) are available for sale and do not require surrender, provided the land stays in trees or is replanted within 4 years of harvest.

The 669 NZUs allocated to the indigenous stands are also technically available for sale as long as the land stays in vegetation going forward.

The 8,784 NZUs allocated to the stock change stands must be surrendered when the trees are felled. There may be some stands that are better left as a long-term crop that can continue to accrue carbon and other non-timber values.

If felled, the replanted forest will be able to receive carbon stock again annually after the residual carbon has rotted and the new crop’s sequestration is well established.

The six stands with “0” area attached to them were registered after the forest was felled and have 4 years from the harvest to be replanted and registered to remain in the ETS and start accruing carbon under the guidelines for the next rotation.

The cumulative 5,669 NZU that could be sold has a current value (as of 19 Oct 10 2023) of 5,669 NZU X $70.00/unit; that is, $396,830.

There is a comment in an NCC spreadsheet against the above 5,669 NZUs, stating that they have no liabilities and could be used for landfill emissions. (For the purpose of this exercise, we have valued these as part of the forest asset.)

Indigenous ETS stands

The following ETS-registered stands are planted or regenerated indigenous species. Two of them are roadside plantings, and the question should be asked if there are more amenity and/or community plantings that could be added to the scheme.

NCC did not measure their indigenous stands and used the Te Ura Rakau indigenous tables in the 2018–2022 Final Emission Return (FER). (per comms PF Olsen and NCC)

Experience shows that the actual carbon yields from measured indigenous stands can be as low as 50% of the MPI tables. This is considered in the next section.

Indigenous stands - add CAAs application submitted in October 2022

	Cpt/Std	CAA	Stand number	Region	Area	Forest Class	Forest Type	Year planted	Application number	Carbon accounting
	Adjascent SH 6	18	1	N/M	1.4		Indigenous	2005	ETSP89ADD-055108	Stock Change
	AS above	19	3	N/M	1.6		Indigenous	2006	ETSP89ADD-055109	Stock Change
	Adjascent 42.10	20	6	N/M	1.3		Indigenous	1994	ETSP89ADD-055110	Stock Change
	adjascednt 42.07	21	5	N/M	5.8		Indigenous	2004	ETSP89ADD-055111	Stock Change
	Std 8.02	22	2	N/M	1		Indigenous	1997	ETSP89ADD-055112	Stock Change
			Total area:		**11.1**					

Options to use ETS-eligible land

If we look at the exotic stands that are still standing (table that follows), then a decision should be made whether they should: continue as a long-life stand, be cut and replaced, (and if so when and with what), or left as is. The first two options are explored below.

Long-life stands

Age	NZU/Yr	NZU$	Ha/$/Yr
(Std 8.02)	Pine	$ 70.00	2.1
CP 3	191	13370	$ 28,077.00
33	36.8	2576	$ 5,409.60
34	36.2	2534	$ 5,321.40
35	35.8	2506	$ 5,262.60
36	35.3	2471	$ 5,189.10
37	34.9	2443	$ 5,130.30
38	34.4	2408	$ 5,056.80
39	34.1	2387	$ 5,012.70
40	33.8	2366	$ 4,968.60
41	33.1	2317	$ 4,865.70
42	32.4	2268	$ 4,762.80
43	31.7	2219	$ 4,659.90
44	31.1	2177	$ 4,571.70
45	30.4	2128	$ 4,468.80
46	29.7	2079	$ 4,365.90
47	29.1	2037	$ 4,277.70
48	28.5	1995	$ 4,189.50
49	27.9	1953	$ 4,101.30
50	27.4	1918	$ 4,027.80
Total			$ 113,719.20

Stand 8/02 (2.1 ha planted in 1991, thus 32 years old) is located in the Maitai, is isolated and is difficult to log.

The adjacent table indicates the carbon flow from effectively 'doing nothing', should NCC opt to keep the stand as a long-life one. (Note that NCC received 401 NZUs (or 191/ha) for CP3 and these are accounted for in the CP3 line under 'Age' in the first column).

This stand (and potentially others) could be left in-situ to continue growing, as examples of long-life *Pinus radiata* and they could continue to collect carbon stock (and credits).

It is also worth noting that the Wellington Botanical Gardens have *P. radiata* estimated at 160 years old, and 100+-year-old stands are scattered across New Zealand. In its home environment, Monterrey pine (as it is known in the US) forms a canopy over the town of the same name and has done for some considerable time.

Cut and replace with another species

Because the land under the ETS-registered trees is confirmed ETS eligible, there is the option to continue to collect carbon going forward. There would be an (approximately) 8-year gap after replanting until carbon could be accrued again. However, after this period, the forest land has the potential to generate between 148 (half of the 297units the MPI tables allocate to indigenous species) and 876 NZU (being derived from the NCC softwood carbon yield table) over the first 40 years of positive sequestration. At $70/NZU, this amounts to between $10,360 for indigenous and $61,320 for softwood species per registered hectare. If the same is done with *Pinus radiata*, the amount increases to 1293 NZUs or $90,510 per registered hectare.

There is a sound logic to keep any ETS-registered stands that do not require harvesting (which could include existing isolated *P. radiata* and cypress (*Cupressus macrocarpa*) growing in situ and continue to collect NZUs annually.

Potential future profile for NCC carbon

The following is an example of NCC leaving the above-mentioned Stand 8/02 (2.1 ha of pine) and Stand 42/08 (5.7 ha of softwood, i.e. C mac, being macrocarpa) standing and allocate the balance of the ETS-eligible land, 6 ha of indigenous species and 120 ha of softwood-mixed species.[4]

When modelling the indigenous profile, a percentage of 50% of the MPI tables was used to allow for a potential reduction when these stands are measured.

Stands 8/02 and 42/08 will accrue carbon from 2023 (in addition to what they already have in account) and the balance of stands is estimated to start accruing carbon in

[1] The existing 11.1 ha of indigenous forest already in the ETS has not been modelled. If *Pinus radiata* is modelled, both the NZUs and financial numbers would be significantly higher; however, if the stand stays in pine, it will continue to accrue carbon in situ, and if it is replanted for a different long-term continuous-canopy species, the pine would be replaced.

2033 (allowing for 2 years before planting is carried out, thereby allowing time to start generating a positive carbon profile on the land beneath).

The above indicates that over the next 48 years, the NCC estate could generate 110,000 NZUs valued at c. $7,700,000 (at $70/NZU) or an average accrual of 2300 NZU/year from when the to-be-planted, transitional stands start to accrue positive carbon.

				NPV.	7.8%	$1,050,820
	Std 8.02	Std 42.08				
Year	Pine	C mac	Indig	Softwood	Total NZU	NZU
Area	2.1	5.7	6	120		$70
2023	191	118			427	$ 29,890
2024	77	135			236	$ 16,525
2025	76	140			241	$ 16,859
2026	75	145			245	$ 17,175
2027	74	148			248	$ 17,383
2028	73	150			250	$ 17,512
2029	72	153			252	$ 17,626
2030	72	154			253	$ 17,723
2031	71	156			254	$ 17,772
2032	70	156			253	$ 17,716
2033	68	156	23	2040	2314	$ 162,009
2034	67	157	26	576	853	$ 59,683
2035	65	157	29	876	1154	$ 80,805
2036	64	156	32	1092	1371	$ 95,964
2037	62	156	34	1320	1600	$ 111,969
2038	61	156	35	1524	1803	$ 126,239
2039	60	154	37	1704	1981	$ 138,695
2040	59	152	38	1872	2147	$ 150,263
2041	58	150	38	2004	2277	$ 159,356
2042	57	147	38	2124	2392	$ 167,437
2043	56	145	38	2232	2497	$ 174,777
2044	55	143	37	2304	2564	$ 179,460
2045	54	140	37	2436	2692	$ 188,412
2046	53	138	35	2496	2747	$ 192,261
2047	53	136	34	2604	2850	$ 199,490
2048	52	133	32	2652	2893	$ 202,499
2049	51	131	31	2724	2960	$ 207,187
2050	50	129	29	2844	3074	$ 215,194
2051	49	127	27	2952	3177	$ 222,403
2052	48	124	26	3048	3268	$ 228,750
2053	47	122	24	3120	3335	$ 233,418
2054	47	120	22	3168	3378	$ 236,426
2055	46	117	20	3216	3420	$ 239,414
2056	45	115	19	3252	3451	$ 241,583
2057	44	113	17	3276	3470	$ 242,890
2058	43	111	16	3288	3477	$ 243,400
2059	42	108	15	3288	3472	$ 243,069
2060	42	106	13	3300	3479	$ 243,558
2061	41	104	12	3300	3475	$ 243,249
2062	40	101	11	3288	3458	$ 242,078
2063	39	99	10	3288	3454	$ 241,748
2064	38	97	9	3276	3437	$ 240,619
2065	37	95	8	3240	3397	$ 237,769
2066	37	92	8	3192	3345	$ 234,142
2067	36	90	7	3168	3316	$ 232,131
2068	35	88	6	3096	3240	$ 226,824
2069	34	86	5	3060	3200	$ 223,994
2070	33	83	5	3000	3136	$ 219,527
Totals					110,212.49	$ 7,714,874

If discounted back at 7.8% (the rate in the PFO valuation process), this provides a present value of $1,050,000.

As at 19 October 2023, the carbon price is $70.00, with pressure for it to climb over the next few years as climate change policies and demand kick in.

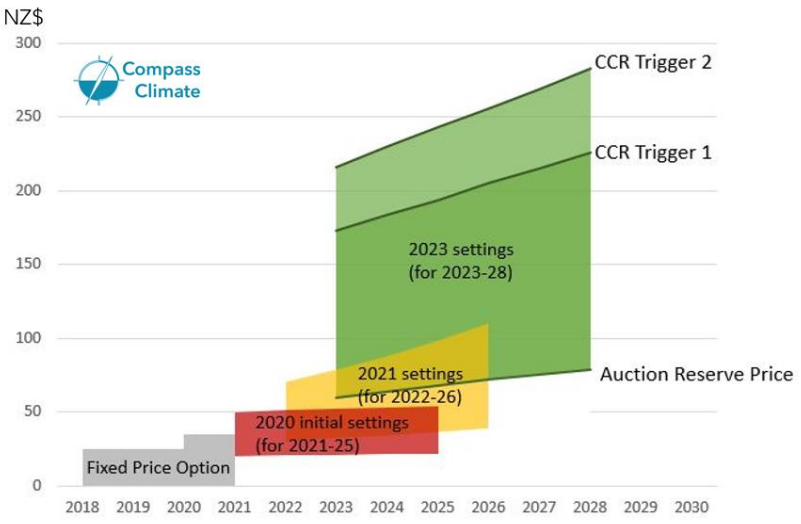
The Task Force believes that any land capable of earning carbon, be it compliance or voluntary, should be identified and a policy or plan adopted to ensure that its capability to generate carbon offsets is fully understood and taken advantage of.

Auction Price Corridor

The following graphic (with carbon price on the left hand axis) from Christina Hood – Climate Compass , Aotearoa NZ - Oct 2023 indicates the price controls previously in the market and the NZ ETS auction price corridor going forward.

This auction price corridor is no guarantee that NZU secondary market prices will rise materially, especially over the longer term. However the rapid increase in auction settings, as recommended by the NZ Climate Change Commission, indicates a direction of travel toward allowing ETS prices to be effective.

This is an excellent indication of where we have come from and where we are going as a nation in this space, reflecting strengthening action over the last five years, consistent with other countries' direction.



Pre-1990 forest land-related carbon

Land designated as 'pre-1990 exotic forest land' is not eligible to receive carbon credits as it was deemed to be in exotic species at the end of 2007 and in forest (indigenous or exotic) at the end of 1989.

There are significant penalties if this land is deforested (i.e. harvested and not replanted within 4 years). Furthermore, for this forest land to remain in the ETS, it must be replanted or regenerated and meet ETS stocking and forest-growth thresholds so that the land is not considered deforested.[5]

Specifically, land is considered 'deforested' by MPI if it does not meet the stocking and growth thresholds below*.

- Four years after clearing, each hectare of the land must have:
  - at least 500 stems of exotic forest species growing, or
  - been replanted with at least 100 stems of willow or poplar species for managing soil erosion, where the local authority has determined the risk of soil erosion is at least moderate, or
  - mostly indigenous forest species, growing in a manner so that the land is likely to be forest within 10 years after clearance.
- Ten years after clearing, each hectare of land must have:
  - mostly exotic species growing, with a tree crown cover of more than 30% from trees that are at least 5 m high, or
  - mostly indigenous forest species growing that meet the definition of forest land in the ETS.
- Twenty years after clearing, if the land contains mostly indigenous forest species, each hectare of forest must have more than 30% crown cover from trees that are at least 5 m high.

These thresholds, and the potential consequences for not meeting them, have informed some of the species and stocking decisions the Task Force has made. In particular, the Task Force does NOT recommend passive regeneration as a viable re-establishment approach on NCC lands, partly because failure of regeneration to would be a costly situation for NCC. As mentioned earlier, at a $70/NZU price plus the $30

[5] These thresholds are different to what makes land ETS eligible in the first rotation.

fine (plus interest if applicable), the costs are c. $69,000/ha. As the carbon price increases, so will these potential costs.

We understand NCC, under the Forest Allocation Plan (FAP), was issued 33,360 NZUs under FAP-5923 for 551 ha. These units were allocated as perceived loss of capital value of the land to landowners that applied for them at the time, and they have since been sold (at the market rate at time of transfer) to the Landfill division for surrender of their emissions as required by the Climate Change Response Act (2002).

Other indigenous non-ETS stands (pre-1990)

A large opportunity for the NCC exists for additional carbon sequestration (not ETS eligible) within its 10,000+-ha indigenous estate that is not ETS eligible.

Currently, worldwide, the non-compliance offset market is larger than the compliance (ETS-type) markets. Voluntary units sell for less than compliance units; however, if (by way of example),10,000 ha accrued 2 units/year at $2/unit, this equates to a potential $20,000/year.

These units might be available if NCC can prove that additional carbon is sequestered from an active animal-control programme. (The Wildlands Ungulate control report contains more detail.)[6]

Even if this sequestration could not be realised within a voluntary carbon market, the measurable improvement would still be a valuable part of Nelson's commitment to the environment and sustainability, and the city's 'story', and that improvement might be eligible for 'bio-diversity' credits on which the Crown is currently consulting.

The Ekos Consulting report discusses a potential 'voluntary carbon opportunity' within these (pre-1990 indigenous) forests, but does not elaborate on what the potential voluntary carbon might be worth – the Task Force believes this should be reviewed.[7]

Recommendation

The Task Force **recommends** that both the compliance (ETS) carbon offsets from post-1989 forested land and the voluntary carbon opportunities potentially available from the pre-1990 indigenous estate be further investigated and a policy adopted that best identifies and uses these opportunities.

Other revenue sources

By far, the greatest non-harvest values the NCC forests can provide is related to:

- water quality
- sedimentation and erosion reduction
- community well-being.

Although these values have not been monetised here, if they are not present, the costs would far exceed the potential harvest revenue to date or expected in the future.

Various concession activities that are present in many forest estates are now considered.

- Income from the apiary industry

  Although there is an opportunity for honey production from a growing mānuka resource, what is missing for many beekeepers (and which they are prepared

[6] Wildlife Management Associates (June 2023), https://drive.google.com/file/d/1S_fMX5JcFeAeZV-nyIxxEOV8Feyydkkn/view?usp=drive_link (accessed 30 Oct 2023)

[7] Sean A Weaver & N. Chand for Ekos Consulting,https://drive.google.com/file/d/1GVTOdEE_jiJ1aVQS1iOr6HqXZ59PqopN/view?usp=share_link (accessed 30th Oct 2023)

to pay for) is a place to store their hives in the winter, where the hives can recover and the bees multiply before the hive are returned to honey-producing sites in the spring. In fact, forestry skid sites make excellent 'spring sites' for winter hive placement.

It is also worth investigating the types of trees that would attract bees. The 'Trees for Bees' website has recommendations for the Nelson/Tasman species.[8]

- Tall-canopy photo opportunities

  Using the forest in this way was very popular at Woodhill Forest, in NSW, and the mature redwoods that are part of the Brook NCC estate would be a suitable site for this activity.

- Horse riding
- Rope courses in the canopy
- Trampolines in the canopy
- Mountain biking
- Sculpture parks with interactive sculptures
- Nature trails.

Many of the above have been very successfully commercialised within forests near a population base in New Zealand, and in Australia and further afield. Nelson is well placed to benefit from hosting individual events in these activities, as well as hang gliding and parasailing.

As a rule, the more popular a free activity is, the greater the opportunity to commercialise 'stand out' versions of that activity within the user groups from further afield.

Report summary

Early in the Task Force's investigations, we were advised that Nelson City Council (NCC) expected to generate less than a 1% return on its investment over a 27-year period of commercial forest activities (refer forestry financials spreadsheet, 2004-2031). Despite this poor fiscal picture, the Task Force believes that NCC has a potentially very valuable total forest resource – one that encompasses the 10,000+ ha of indigenous forest as well as the small commercial estate.

However, the Task Force concludes that NCC has, to date, missed an opportunity to maximise the many values the forests provide to the Nelson community.

Given the apparent environmental and pest-related degradation of the total 10,000+ ha estate, the potential to improve carbon sequestration and biodiversity seems immense, with some quick gains possible and long-term improvements attainable.

Recommendations

1. The Task Force **recommends** further investigation of the compliance (Emission Trading Scheme; ETS) carbon offsets from post-1989 forested land, the voluntary carbon, biodiversity credit, and the other opportunities potentially available from the balance of the exotic and wider indigenous estate and that a policy be adopted that best identifies and uses these opportunities.

[8] https://static1.squarespace.com/static/5c354d3031d4df3e72d75662/t/5cb6e23b15fcc00dbe498872/1555489340463/New-S2-NelsonTasman.pdf, accessed 28 Oct 2023.

- With this would come other fiscal opportunities from concessions, the apiary industry and others.
- PF Olsen Limited (PFO) currently manages, values and harvests NCC commercial forests. In its June 2023 valuation, PFO chose to value 39 stands capable of making a positive harvest return. Of those 39 stands, only 26 are over 3 ha in size. These stands are valued at $4,023,000.
- The size of the NCC budget to support these few commercial stands seems disproportionate to the financial value that appears to be expected. The Task Force therefore believes it is timely to review this situation, given all the other values that the community have identified they want and which NCC's total forest estate is able to provide, if invested into correctly.

2. We **recommend** that NCC sell identified cutting rights to select stands for one rotation, inclusive of conditions relating to: ongoing public access, forest management, harvesting, time frames and hand-back, to reinvest in the forest transitions recommended in the Task Force's Report.

- To facilitate the sale of its standing crop, NCC will need to use an experienced forest sale agent to work with PFO and others to determine appropriate forest stands for sale and to determine what the hand-back (after harvest time frames) might look like.
- From these determinations, a reputable plan, timetable and budget with attainable key performance indicators (KPIs) can be quickly developed.

ETS Credits

In May 2023, NCC received 14,453 NZU (of which 8784 require surrender if all trees are felled), with a total current value of $1,011,710 (at a 19 Oct 2023 price of $70/NZU).

3. We **recommend** that these forestry credits, and all future carbon, voluntary carbon, biodiversity credits and other revenue streams from the forest lands should be ring-fenced for any future forest harvest liabilities and to fund the forest transition, community well-being within forest and forest estate restoration.

Potential savings?

It is estimated that the following items could free up more than $6m for reinvestment into NCC forests and underlying land:

Money currently in the Forestry Account (Oct 2023)	$ -32,000
Sale of cutting rights (commercial stands)	$ 4,022,900
Management cost savings over the next 10 years	$ 2,000,000
Value of unobligated carbon in NCC account	$ 396,830 (@ $70/NZU)
Total	**$6,387,730**

It is also anticipated that further income from 'un-obligated carbon', concessions and specific-project finance may become available once NCC has a proven track record in carrying out and sustaining an active forest transition programme.

Strategic Planning & Decision Making –
analysis, action plans, and recommendations

Lead author: John Hutton
Co-authors: Morgan Williams & Stuart Orme

Executive summary

This is one of four papers that provide the framework for decision making across the entire 10,000+ Nelson City Council (NCC) forest estate and within the four areas containing commercial forests - the Maitai, Brook, Marsden and Roding.

This review canvasses a number of key steps in strategic planning, including:

- The need to take a strategic approach in large or costly projects to achieve desired benefits.
- The usefulness of having a strategy, and of strategic thinking and planning, including the Treasury New Zealand's declaration of the importance of such thinking and planning in its 2020 'expectations' to provide:
  – alignment with government policies
  – maximisation of value for money
  – increasing likelihood of success
  – transparency and trust in public institutions
  – inter-generational well-being of New Zealanders.

Examples of problem solving and critical thinking are noted as useful:

- – fishbone diagram
- – corkscrew learning.

The review also focuses on the specifics related to the challenges faced by the Right Tree Right Place (RTRP) Task Force and the approach it took to meeting those challenges by:

- applying a structure that entails breaking down the work to be done into smaller steps
- applying a decision matrix for each of four catchments
- using a ladder-of-inference approach to the information it gathered from research and input from and relevant experts
- reviewing a local example of strategic planning for a forestry transition environment, through a review of the approach taken by the Kingsland Forest Park Development Plan.

Finally, a step-by-step approach is suggested for application to the RTRP challenges, with specific notes for what the Task Force has done on that strategic thinking and planning journey.

Need for a strategic approach

The thinking and planning associated with any project, particularly a large, expensive, and/or lengthy major project usually requires a degree of attention that smaller, less expensive minor projects can safely avoid. With 'major' projects, the

resources required in terms of peoples' time, the funding costs and the opportunity costs, are simply too great to leave to chance or a simple 'desk exercise'.

The RTRP Task Force has been handed a challenge that deals with the timing of work (and related expenses and benefits) that spans decades, if not longer, and that most certainly qualifies as a major project. It demands proper due diligence and a long-term (ie., strategic) approach.

Essential to a better understanding of Nelson City Council's (NCC's) process as it considers the future of its forestry interests and activities is familiarisation with the requirements of a strategic approach. These requirements are presented below. It is noted that NCC's commercial interests make up a small component of the 10,000+ hectares ha of a very valuable indigenous forest estate that is in the conservation and water reserves of the Council.

Strategy and strategic thinking and planning

Oddly enough, even though management, as a profession, can trace its roots to the 1950s and 1960s, it wasn't until the mid-late 1970s that terms like 'strategic management' became commonly used in the corporate world, as noted in a McKinsey & Co staff paper, in 1978.[1]

The authors also presented McKinsey's original definition of strategy as: 'an integrated set of actions designed to create a sustainable advantage' (albeit, this advantage was to be 'over competitors').[2]

Closer to home, after embarking on the modernisation of the public finance system and initiating strategic planning, the New Zealand Government (via Treasury New Zealand) issued its 'general expectations for strategic planning' in December, 2020[3], and stated one of the principal reasons why strategic thinking and planning was important (in public agencies) was because:

> *"…the choices agencies make and the results agencies deliver with public funding have significant intergenerational impacts …the behaviours and processes which support strategic thinking and planning help advance stewardship and the long-term public interest".*[4]

It is worth noting another comment from the Treasury document, about the importance of integration and intergenerational focus:

> *"Integrating strategic thinking, strategic planning, decision-making and delivery enhances effective strategic financial management and overall management of resources. Agencies will get the most value out of their strategic thinking and planning when this is integrated into decision-making and delivery of policies and services. Integration enables decision-making which:*
>
> - *aligns with government priorities*
> - *maximises value for money*
> - *increases the likelihood of desired changes in outcomes being achieved*
> - *fosters transparency and trust in public institutions, and*

[1] Gluck, F.W. et al. June 2000. Thinking Strategically, McKinsey & Co. https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/thinking-strategically, accessed 24 Oct 2023.
[2] ibid.
[3] Cabinet's general expectations for strategic planning, Treasury New Zealand, December 2020, https://www.treasury.govt.nz/sites/default/files/2020-12/cabinets-general-expectations-strategic-planning.pdf, accessed 24 Oct 2023.
[4] Ibid., page 2.

- *improves the intergenerational wellbeing of New Zealanders".*[5]

In summary, effective strategic thinking and planning:

- increases the potential of an organisation to achieve its priorities and goals, of an organisation which are aligned with the long-term vision of the organisation
- gives observers (ratepayers, in NCC's case) visibility of what's happening, which in turn can increase credibility and the acceptance of proposed change(s), and
- facilitates taking a long-term operational approach.

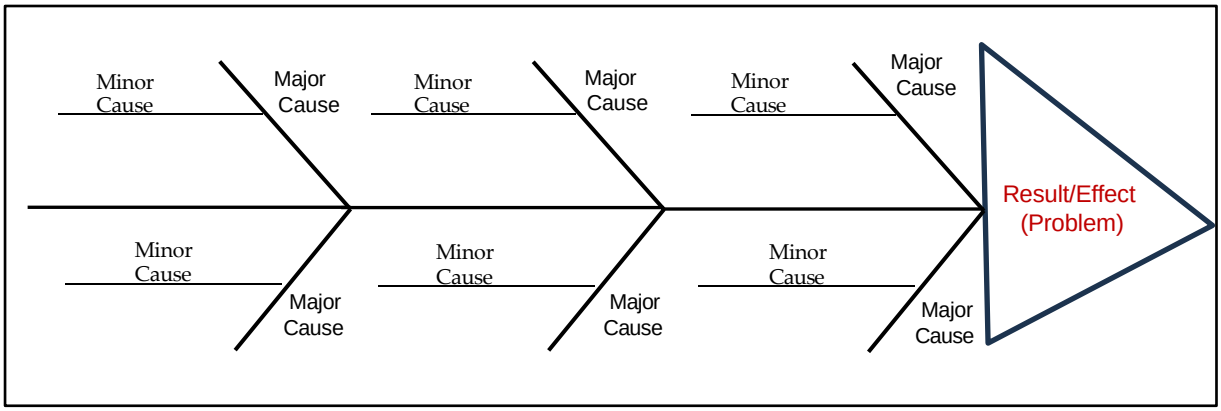
As such, it is not only worthwhile but indeed critical to success to take a strategic thinking and planning approach. And, it is exactly such an approach that the RTRP Task Force is suggesting in its recommendations.

Any strategic planning and decision-making process requires a vision to enable framing of what an organisation intends to do, and how to achieve its goals or objectives. It is no different for the process used by the RTRP Task Force in conducting its reviews, and it would be no different for NCC's assessment of the recommendations of the RTRP Task Force, ie., the Council will base its decisions on its long-term vision or aspiration for its commercial forestry assets in the context of its total forest asset, which covers of over 10,000 ha.

The vision or aspiration statement of the RTRP Task Force is: a resilient, permanently forested landscape, rich in biodiversity, that supports the many values of the Te Tauihu community and its future generations.

Two approaches to problem solving and critical thinking for developing strategic decision making

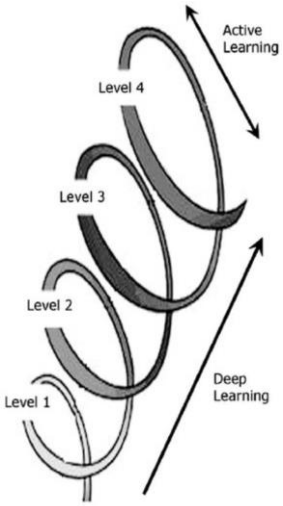
Aa cause-and-effect analysis is one approach. It allows for a breaking down of the various causes (major and minor) that together contribute to making a 'situation' a problem that needs to be resolved. The fishbone diagram below presents the essence of this approach.[6]



A second approach is the continual thinking and/or development one, which some authors frame as 'The Learning Spiral'.[7] It depends on learning, specifically learning how problems and their solutions can evolve over time, and this approach

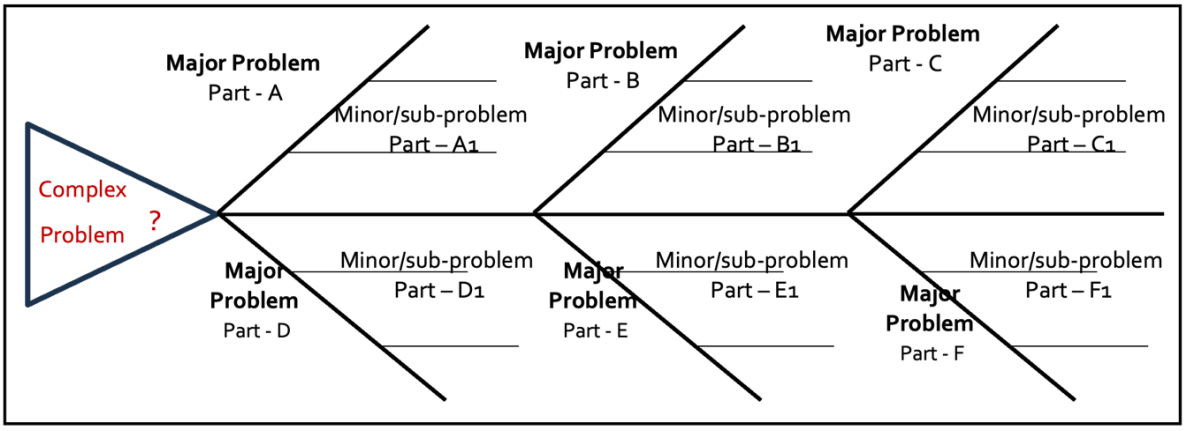
[5] Cabinet's general expectations for strategic planning, ibid. page 5.
[6] Strategic Management Associates project work, J Hutton, 1989, personal files.
[7] Nina Diamond, et al,. *The Learning Spiral,* Research Gate – innovative strategic tools to enhance problem solving; website extract: https://www.researchgate.net/figure/The-Learning-Spiral_fig1_247753070, accessed 24 Oct 2023.

makes it likely that solutions can improve to meet changing circumstances. A good analogy is a corkscrew.



Examples of decision-making frameworks

The fishbone diagram (presented above), and the processes it represents, can be reversed, as shown below, where the problem is broken down into its component parts. This approach is sometimes depicted as a decision tree in upright position, or fault tree.)[8]



[8] Strategic Management Associates, J Hutton. [ideally, these footnotes should have more info than your business name and yours, John. Have the terms been published somewhere?]

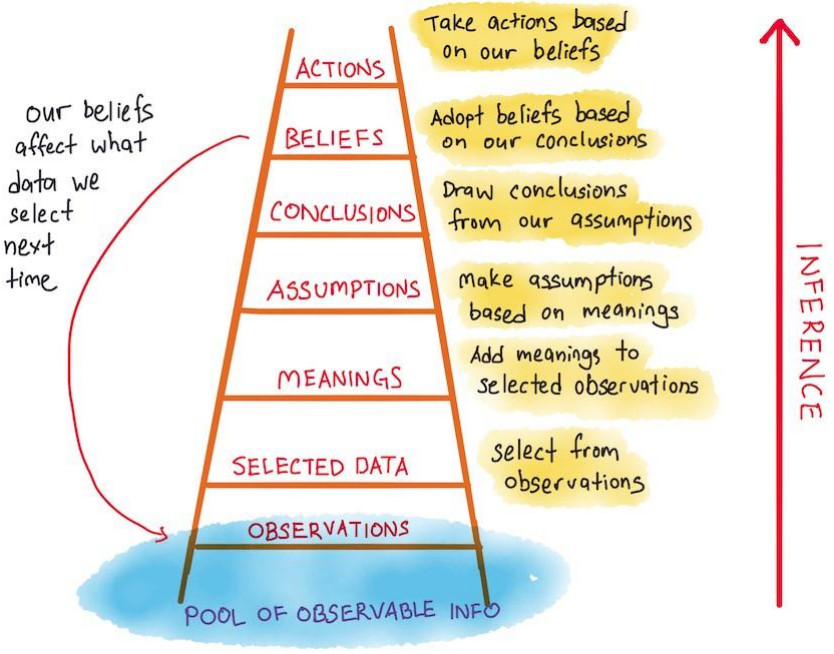
Decision matrix

The RTRP Task Force used decision matrices in its analysis of the four NCC catchments and their commercial forest areas, including the one below for the Roding Catchment.

	Transition/Continuation		Outcomes						
Value* & Scenario	Cost or Affordability 1=high 5=low	Risks 1=high 5=low	Net Revenue	Amenity, Spiritual, Moral	Tourism & Recreational	Biodiversity Enhancement	Air, Soil & Water Quality Improvement	Flood, Sedimentation & Pest Control / Management	Scenario Score
Take active steps to plant other species – exotic & indigenous in all stands The 'MIXED' Scenario	Revenue from other exotics less certain but longer term and higher per m^3 Depends also on whether animal and wilding-pine control programmes are brought into this option	Potential better income from alternative exotics Better tailored risk to stands Fire risk Animal pest control needed Some wilding pine removal needed Weed competition, especially gorse Establishment failure	Voluntary carbon and biodiversity market potential Other income sources: lease for honey; external co-funding Costs vs revenue significant for natives	Positively impacts these values/ outcomes	Exotic and permanent forests possible Economic return to the region at this location likely to be low Enhanced access opportunity (depends on TDC maintenance of Aniseed alley public road)	Permanent and selectively harvested forests mean significantly less habitat disturbance Tree species can enhance outcomes	Permanent forests preferred Enhanced outcomes Long-term carbon sequestration But, transition time has risks	Re-establishing canopy is key to mitigating risk on steep slopes – faster growing exotics could be nursery species for natives Enhanced outcomes due to less soil disturbance but transition risks Active pest management preferable	
Score/Total	4	3	4	2	3	2	3	3	24/40

Ladder of inference

Another useful tool in strategic decision making is the ladder of inference, which allows the strategic thinker/planner to review and consider the assumptions behind their own decisions. Using this tool often reveals subconscious biases and so ladders of inference can be used to un-pick decisions and reveal unfair or poorly based decisions, to get strategic thinking back on track. Here's an example:[9]



For all the above frameworks and tools, the wise strategist needs to first remember that:

- Old beliefs do not lead to new horizons
- The quicker a strategist lets go of old ideas/ beliefs, the sooner new solutions will be found
- The more important something is to a strategist, the more that person will want to hang onto it.

A local example of strategic planning for a forestry environment

Strategic planning is currently being used effectively by Tasman District Council in the forestry re-development of Kingsland Forest Park.

For example, the *Kingsland Forest Park Development Plan* called for the following actions and work outputs for its implementation:

- Key outcomes sought

[9] With thanks to Holistics, a self-service Business Intelligence platform. as seen at: https://www.holistics.io/blog/content/images/2020/07/ladder_of_inference_data_analytics.png, accessed 24 Oct 2023.

- Project plan actions
- Critical issues identified
- Site location
- Current land use
- Neighbouring land use
  - — Nelson City Council
  - — Silvan Forest
  - — Other landowners
- Land use, including:
  - — Forest cover
  - — Catchment management
  - — Landscape protection and enhancement
  - — Cultural, historical and archaeological values
  - — Biodiversity restoration
  - — Fire prevention, control and safety
  - — Utilities infrastructure
- Recreational use

Additional documents included assessment results comparing options with objectives, and all relevant supporting references.[10]

Developing a strategic plan and implementing strategic decisions

The nature (in terms of complexity and extent) of the situation, as well as the operating environment (commercial, governmental or private) will influence the choice of how to develop a strategic plan. In particular, the number of key steps to be followed can vary.

In the case of NCC's RTRP Task Force, the challenge it faced was complex:

- The parties impacted by any Council decision are a mix of commercial, recreational, environmental and community interests with many, varied positions and expectations – often at odds with each other.
- The situation potentially calls for changes to long-standing commercial practices affecting 600+ ha – some land that is obvious ('front-facing') and some that is not obvious ('back country'); this commercial section is a fraction of the 10,000+ ha of forested lands.
- The production forest lands at the heart of the Task Force review (the 600+ ha in the Maitai, Marsden, Roding and Brook catchments) are discontinuous, and spread over a wide range of conservation and other protected lands, totalling over 10,000 ha of predominantly indigenous forests.

[10] Tasman District Council, July 2020. *Kingsland Forest Park Development Plan*. Richmond, https://www.tasman.govt.nz/my-council/key-documents/more/environment-reserves-and-open-space/kingsland-forest-development-plan/, accessed 25 Oct 2023.

A seven-step approach to strategic planning

In this complex, mixed governmental–commercial situation facing NCC, the following seven step approach to developing a strategic plan is suggested. Note that the aim of the Task Force recommendations is to provide essential input to these steps.

i. Frame the challenge
ii. Gather information; assess and evaluate the current situation
iii. Identify the desired future state
iv. Identify and evaluate the preferred options/alternative to achieve the desired future state
v. Develop an action plant to get to the desired future state
vi. Operationalise the action plan to achieve goals – what, when how, etc
vii. Adapt and learn: change as appropriate to experience and facts

How the RTRP Task Force addressed these challenges:

Steps in the development of a strategic plan for NCC's RTRP	Task Force actions
i. Frame the challenge - what is the problem? - what is the background? - what are the current risks and opportunities? - what strategic issues are to be dealt with?	- Collected and analysed extensive range of NCC reports - Researched area history, prior uses, methods, etc. - Identified current risks and opportunities - Identified strategic issues
ii. Garner information; assess and evaluate the current situation - interested parties' (and experts') opinions, needs, wants - understand underlying issues, causes - situational analysis in NZ, NCC's forests, adjacent landowners, others - identify what works and what doesn't - research and analyse methods, approaches	- Conducted three public discussion sessions, collected feedback, input, comments and suggestions - Collected extensive stand-by-stand information, current treatment and harvesting activities, plans - Identified appropriate and usable approaches by reviewing scientific and ecology-based reports
iii. Identify the desired future - identify the preferred/desired future state using accumulated research, surveys, interested party submissions and comments, scientific journals, etc.	- Developed a description of the desired/preferred future state
iv. Identify and evaluate options to achieve the desired future state	- Recommendations are noted in the report to Council

Steps in the development of a strategic plan for NCC's RTRP	Task Force actions
- develop recommendations on: what, where, when to plant and how to prepare and plant	
v. Action plan to get to desired state - develop the implementation plan on: - key outcomes (meet the community's values) - precursor inputs (maps, imaging, pest information, issues) - select planting options (step IV)	- Recommendations are noted in the report to Council
vi. Operationalise the action plan to achieve the goals, specifying what, when, how, where, etc.	- Recommendations are noted in the report to Council
vii. Adapt and learn, suggesting change based on facts and experience	- Recommendations are noted in the report to Council

Summary and recommendations

Many challenges, posed by a range of complex variables, faced the RTRP Task Force as it sought to draw up a meaningful, cohesive and practical set of recommendations for the NCC. In its journey from knowledge acquisition to producing meaningful recommendations, the Task Force took its own strategic approach to the information gathering, analysis and inter-generational thinking that is noted in this review.

In addition to outlining the approach taken by the Task Force, a range of analytical tools are presented, as well as a useful local example that identifies many of the specific categories to be considered when thinking strategically about inter-generational remediation of commercially harvested forest lands.

How the Task Force addressed these challenges and the different ways it looked at the problems facing Council are summarised below, noting specific steps. And, because of the importance of this approach, it is re-stated here, as a basis for identifying the recommendations appropriate for NCC and its forested lands:

i. Frame the challenge

ii. Gather information; assess and evaluate the current situation

iii. Identify the desired future stage

iv. Identify and evaluate the preferred options/alternative to achieve the desired future state

v. Develop an action plan to get to the desired future state

vi. Operationalise the action plan to achieve goals – what, when how, etc

vii. Adapt and learn: change as appropriate to experience and facts

Recommendations:

1) Confirm the goal(s) (ie., the ideal future state) NCC wants for its 10,000+ ha of forested lands
2) Develop an overall strategic plan for achieving those goals
3) Develop a workable action plan to operationalise the achievement of the strategic plan. This plan should include, among other things:
    a) details of each of the 83 stands reviewed by the Task Force, showing the disposition of those stands (or parts thereof)
    b) estimated timing for all activities – i.e. spraying regimes, planting activities (by season, year, etc.)
    c) estimated costs for each major phase of the plan and how costs will be funded
    d) a community engagement programme to advise of the plan and its progress
    e) identification of standards and methods and processes for:
        i) which species of trees and shrubs are to be planted (generally)
        ii) how planters are to be selected and trained
        iii) what parameters apply to each planting session (stems per hectare, species placement, etc.)
        iv) when planting is to occur for various species
    f) maintenance, evaluation and adaptation

Enhancing Forest Stewardship – community & governance opportunities

Lead author: Morgan Williams
Co-authors: Joanne Clapcott & Rachel Sanson

Executive summary

This paper explores the relationships that communities have with forests and their desires to contribute to their governance opportunities.

Over the last 200 years, New Zealand has had a massive transition from indigenous old-growth forest exploitation to establishing and harvesting from exotic plantations. So now we have a very binary forest scene: largely fully protected, indigenous forest lands and a monocultural, exotic forest production system based largely on clear-felling. Today the vast majority of New Zealand's wood products are derived from radiata pine forests with an almost total lack of any mixed-species/mixed-use forest such as those dominant throughout Europe.

This raises two questions:

- Is there a place for the expansion of multi-use forests in New Zealand?
- Is there value in expanding more direct community involvement, both strategically and operationally, in all local government-owned forests, such as those owned by NCC?

Such expansion and community involvement would serve to strengthen the opportunities for improved biodiversity outcomes of indigenous forest areas and could enable and empower more creative transitions of NCC's current commercial forest areas to permanent and continuous-canopy forests.

The body of evidence, both in New Zealand and internationally, is that community recognition of forests' many values is rising, as is the desire by the community to be involved in forest management and care. Hence, we have the rise of community trusts that have given birth to successful sanctuaries and massive pest-control efforts. Additionally, there is increasing recognition and empowerment of the kaitiakitanga rights and responsibilities of tangata whenua. Clearly, there is a strong and well-documented case for more structured input to the management of, and care of, NCC's 10,000+ ha of forest estate.

Accordingly, it is recommended that:

Future governance and management of NCC's forestland should include an independent community entity to maintain a local tangata whenua and intergenerational input, and to facilitate private and public investment in all future forest management.

Scene setting

This is one of four papers that provide the framework for decision making across the entire 10,000+ Nelson City Council (NCC) forest estate and within the four areas containing commercial forests - the Maitai, Brook, Marsden and Roding.

The purpose of this paper is to explore the relationships that communities have with forests, including the very diverse range of values sought by these

communities. These relationships are viewed from a global and an Aotearoa New Zealand perspective. An in-depth look at local Nelson community values in relation to forests is provided in the background review 'Evolving ecologies – community aspirations, forest transition options and challenges'.

Despite several centuries of urbanisation, there have remained strong relationships between communities and their forests (and nature more generally). There also seems to be a sense that those relationships are deepening and becoming more intense.

Contributing to this apparent trend of strengthening relationships is concern for: the loss of biodiversity, the negative impacts of climate change, and the declining health of rivers, lakes and wetlands.

At the heart of many community–forest relationships has been the desire to ensure that the resources provided by forests are managed with a long-term view, spanning many human generations. The demands on the forest resource have expanded over recent centuries from using it to provide the basic services of fuel, timber and wild-foods to also encompass using it to protect water and soil biodiversity, to support recreational pursuits, and to provide amenity and intrinsic values.

The commerce–forest relationship in New Zealand has also changed from being predominantly based on extracting old-growth forest timber (a millennium-long process in Europe) to much more intensive management of commercial forests, including large-scale planting and harvesting of single exotic species, such as *Pinus radiata* in New Zealand.

With scarce old-growth forests remaining, the need to conserve (rather than extract from) some forests became apparent, and formal protection mechanisms were established via a system of national parks throughout New Zealand. Tongariro National Park, established in 1894, was New Zealand's first and the world's fourth.[1]

The growing global trend to protect forests, and the quality of waters that flow from them, has intensified as evidence of species and biodiversity losses has accumulated. However, there are many overseas forests for which local community management has allowed a balance to be struck between sometimes competing values, thereby enabling sustainable harvesting of diverse resources (such as honey, fungi, nuts, firewood and timbers) as well as providing recreation and amenity values. This is arguably not the dominant paradigm in New Zealand and we must look to the past to explore why.

There are some distinct elements to New Zealand's evolving community–forest relationships. The first is well documented – Gondwana forests covered more than 80 percent of the land and were exposed to no human impacts until less than 1000 years ago, with the arrival of Māori. Not only did the kiore (the Pacific rat) that they introduced have significant impacts, but so too did the Māori practice of burning large tracts of vegetation.[2]

Māori burnt large tracts of forest to support their largely hunter-gatherer-grower lifestyles, mainly on the coasts. European settlement brought more intense clearing of forests. For example, in a single decade, from 1890 to 1900, 27

[1] Tongariro National Park, Department of Conservation website; https://www.doc.govt.nz/parks-and-recreation/places-to-go/central-north-island/places/tongariro-national-park/?tab-id=50578, accessed 21 Oct 2023.

[2] TeAra, The Encyclopaedia of New Zealand: Kiore – Pacific rats. https://teara.govt.nz/en/kiore-pacific-rats, accessed 21 Oct 2023.

percent of New Zealand's existing forest was cleared to provide space for pasture.[3]

In response to this destruction, initiatives to protect remaining old-growth forest began in the late 19th century with the aforementioned creation of Tongariro National Park and have accelerated in recent decades with the designation of large parks, such as Kahurangi in the Nelson–Tasman region. Until relatively recently, most conservation efforts were 'owned' or managed by public agencies.

Meanwhile, production forestry continued within indigenous forests against evermore protest and opposition, leading ultimately to a cessation of harvesting in indigenous crown forests in the 1980s.

Parallel to this, starting in the 1920s, New Zealand embarked on a massive expansion of softwood forests, primarily of *P. radiata*. Large-scale plantings began in the central North Island and in Golden Downs in the 1920s on lands found unsuitable for livestock due to cobalt deficiency. Plantings subsequently expanded into erosion-prone hill country, to stabilise the land, as well as ultimately to provide timber. The result: most of New Zealand's timber today comes from radiata pine forests and most is exported as logs.

The challenges presented by this commercial forestry model are now widely debated, almost daily.

Community relationships with forests

Forest evolution in New Zealand has delivered us a very 'binary' forest 'landscape'. Forests are either for non-extractive purposes – enhancing biodiversity, protecting wildlife, protecting watersheds and providing recreational values, or they are for extractive purposes, with the dominant model being a short-rotation (in forest terms) monoculture, that is harvested by clear-felling every 25 to 30 years.

There is virtually no recognition in New Zealand of the multi-use (extractive and non-extractive) forests that many other countries and cultures have been growing, managing and benefitting from for millennia.

This raises two questions.

- Is there a place for the expansion of multi-use forests in New Zealand?
- Is there value in more direct community involvement, both strategically and operationally, in all local government-owned forests, such as those owned by Nelson City Council (NCC)?

Such expansion and community involvement would serve to strengthen the opportunities for improved biodiversity outcomes of indigenous forest areas and could enable and empower more creative transitions of current NCC commercial forest areas to permanent and continuous-canopy forests.

Organised community engagement with forests

The destruction of New Zealand's indigenous forests, and introduction of many pests harmful to wildlife, led to the first great efforts by dedicated scientists and

[3] https://environment.govt.nz/assets/Publications/Files/ser-1997.pdf **- Chapter 8.**

conservationists to save species such as the Chatham Islands black robin, takahe, kakapo and black stilt.[4]

The innovative focus on species breeding as a way to bring species back from the brink of extinction ultimately morphed into the creation of pest-free habitats to enhance survival rates. In addition to island sanctuaries, New Zealand now has six ring-fenced sanctuaries ranging from the 89-ha Bush Park, Tarapuruhi, near Whanganui, to the largest at Maungatautari (3400 ha, in the Waikato).

Our local gem, the Brook Waimārama Sanctuary, is New Zealand's second largest, at 691 ha. An important aspect of the pioneering work to create the Sanctuary was that it was then, and continues to be, community driven.

The genesis of forest sanctuaries was in Wellington, with a Royal Forest and Bird Society couple, Jim and Eve Lynch, who conceived the idea of 'bringing birds back to Wellington' and saw the opportunity in the Karori Reservoir site. A community trust was formed in 1995, the concept plan for a fence developed, funding raised, and a 30-year renewal lease signed with the Wellington City Council in 1999. Karori Sanctuary, now Zealandia Te Māra a Tanē, was born –- a world first.[5]

In addition to the six ring-fenced sanctuaries, there are also seven peninsulas throughout the country that have been fenced off and are kept pest free. All but one of the 12 sanctuaries on these seven peninsulas have been community-conceived and led, and they operate under legally established trusts. The sanctuary lands are either privately or iwi-owned or on a lease from a local authority.

In addition to these particular community trusts, there are also numerous local and national community conservation and forest groups and trusts. A significant regional example is the Tasman Environmental Trust, which is supported by many local and national agencies and, with its budget for 2022 of $2.37 million, is supporting a wide range of ecological restoration initiatives in the region.

Another notable regional project is Project Janszoon – a major philanthropic trust that has partnered with the Department of Conservation (DOC) to support restoration initiatives in Abel Tasman National Park.[6]

Further afield, other relevant examples are the New Zealand Conservation Trust, based at Willowbank Wildlife Reserve in Christchurch; the Rod Donald Banks Peninsula Trust; and the Native Forest Restoration Trust, which has 30 reserves established throughout New Zealand, totalling over 8000 ha. Most of these 30 reserves are managed by local community groups.

At the interface of conservation and forest production, and operating New Zealand wide, is Tane's Tree Trust, which focuses on promoting the use of indigenous tree species, encouraging biodiversity and landscape enhancement, and providing the opportunity for sustainable production of high-quality timber and other resources.

As always, when many organisations are endeavouring to address complex shared issues such as the future of the nation's forests, people need to be made aware of 'who is doing what' across large contiguous parts of New Zealand. One such initiative is the Kotahitanga mo Taiao Alliance. This group brings together all

[4] Robinson H.A. et al. 2021. Conservation status of birds in Aotearoa New Zealand, 2021. New Zealand Threat Classification Series 36. Wellington: Department of Conservation 43.pp. https://www.doc.govt.nz/globalassets/documents/science-and-technical/nztcs36entire.pdf, accessed 21 Oct 2023.
[5] https://www.visitzealandia.com/About#History, accessed 21 Oct 2023.
[6] https://www.janszoon.org/about/, accessed 21 Oct 2023.

nine iwi of Te Tauihu o Te Waka ā Māui, six local councils and three central government departments.

The focus of the Alliance is on landscape-scale conservation projects that also have environmental, social, economic and cultural benefits. Many of these projects will be led by community groups under a trust model.

The role of volunteers

New Zealand has a huge number of volunteers that come together to form all sorts of community groups with shared goals and objectives.The capacity of such environmental volunteers is evident throughout New Zealand in the care of the nation's waterways, establishment of riparian plantings, and intensive pest-control programmes in forests – particularly on urban fringes, but increasingly at larger scales as innovative trapping and baiting technologies emerge.

Community groups of volunteers often coalesce to form collectives to scale-up their efforts. These collectives can be described as community networks; tangata whenua-led collectives; project-based collectives; agency-led collectives; and partnership initiatives. What they have in common with their many constituent community groups is the use of a trust model or some formal arrangement to raise money and direct investment.[7]

There are also numerous smaller groups of volunteers that are supported by local government and central government agencies. Nelson city, for example, currently has 13 environmental volunteer groups undertaking a wide range of activities, and many more less formal, adopt-a-spot groups helping to improve biodiversity outcomes.

In addition, whanau/hapu/iwi around the country self-organize to fulfil kaitiakitanga rights and responsibilities resulting in numerous different operational models that involve partnership and collaboration with each other and/or other organisations.

To optimise the increased volunteer contribution to all aspects of forest care in New Zealand appropriate governance is essential. Partnerships, characterised by mutual cooperation and responsibility for the achievement of agreed goals, are a dominant paradigm.

With trusts, this arrangement usually involves a partnership that provides direction as well as operational support. The legal implications of such cooperative partnerships have received increasing scrutiny as their importance has grown. The importance of this is highlighted in the following conclusion from a 2013 New Zealand Law Society conference paper by barrister Clare Lenihan:

> *An increasing trend in recent years has seen a desire by the community to be more involved in not only carrying out conservation work but having a role in directing it. New collaborations are occurring and examples of non-statutory co-governance and co-management in practice are emerging from the ground level.*

[7] McFarlane, K. et al. 2021. Collective approaches to ecosystem regeneration in Aotearoa New Zealand. Nelson: Cawthron Institute. 84p. https://bioheritage.nz/wp-content/uploads/2019/04/McFarlane-et-al-2021-CawRpt_3725_Bioheritage-report_Collective-action.pdf, accessed 21 Oct 2023.

> *With this trend comes increasing accountabilities for all parties and there is a need to consciously develop policy and procedure to accommodate this.*[8]

The desire of communities to not only help but lead is a valuable route to establishing and maintaining deep community engagement and inter-generational commitment to ensure the health of forests, and thus the health of communities is also furthered.

Communities and forests – global examples

Globally, there are many examples of community–forest relationships and their ownership structures and stewardship models, including some that span centuries. Research has highlighted that relationships are an inextricable component of community forestry, and that people who engage consciously with forests will be changed by the experience:

> *That which is valued has meaning in people's lives. If community relations, and in turn their relationship with a forest, are valued, that is part of a sustainable society, and provides a platform for continuation and adaptation.*[9]

The paper quoted above examines a wealth of community–forest relationships in Europe and UK. The authors looked at 15 cases in Italy, Scotland, Slovenia and Sweden through four dimensions (forest, community, relationships between them, and their relationships with wider society), The study revealed how European ownership arrangements and management strategies contribute to wider community discourses about natural resource management. Options for environmental governance involved 'tradition' and 'innovation'. The authors noted that the options evolved, rather than remained static. The cases had all emerged from long histories of political and environmental pressures but clearly illustrated that there are many values to be derived from extensive engagement with a community's forests, and that actual ownership of them was not central to the success of the relationships. This long and complex study requires, and warrants, additional examination to extract insights applicable to New Zealand forest–community relationships and forest stewardship.

The European Forest Institute (EFI; https://efi.int) keeps track of a vast range of forest matters spanning the whole of continental Europe and the UK. The EFI data show that most forests (85 percent) in Europe are available for timber supply. However, these forests also provide many other products such as fungi and berries, and in some regions, the income generated by collecting these is economically more important than that generated by timber harvest. For about 1.7 million European households, marketing of non-wood forest products is the main income source.[10]

That said, all European citizens consume wood-based products, ranging from furniture to paper products. Although they appreciate forests for the many societal benefits they provide, when citizens were asked about their perceptions of forests and their benefits, it was the environmental benefits that were most well-known, receiving the highest levels of appreciation. For example,

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[8] Lenihan, Clare. 2013. Co-governance and co-management – a view from the ground up. NZ Law Society Conference April 2013. The author is contactable at environmentallawyer.co.nz.

[9] Lawrence A. et. al. 2021. Forests in common. Ambio: DOI https://doi.org/10.1007/s13280-020-01377-x, accessed 21 Oct 2023.

[10] https://efi.int/forestquestions/q10, accessed 21 Oct 2023.

participants cited forests' ability to absorb carbon, provide natural habitat and protect people from natural disasters.

Notably, the economic potential of forests – such as providing wooden products and energy, contributing to employment, providing green jobs and supporting rural development – did not score highly.[11]

Lower scores were also accorded to the importance of forests for healthy leisure activities, although there were large regional variations in Europe, as outdoor recreation is much more appreciated in northern compared to southern member states. For example, Norwegians have a very high level of engagement with their forests: 77 percent of Norwegians visit forests weekly, and 25 percent, daily. This is possible because Norwegian towns and cities are typically surrounded by forests.[12]

Some European Union (EU) studies indicate general satisfaction with forest management, but note regional differences and some negative perceptions of forestry operations. People with a professional background in forestry show significantly higher support for silvicultural operations and the economic use of forests than do the general public.

In general, visible signs of intensive harvesting (especially of clear-felling and of the impacts of harvesting machinery on forest areas, and forest roads) are often perceived negatively by citizens. In contrast, mixed and richly structured forests and sensitive-to-nature management are positively viewed. Large trees are perceived as beautiful.

Of particular interest are apparent trade-offs between societal preferences regarding forest ecosystem services, and production forestry objectives, when these are translated into concrete forest management interventions.

The trade-offs might not be considered by the general public when surveyed. Some studies point out that a relatively high percentage of respondents feel poorly informed about forests and have little knowledge about the purposes and effects of forest management. This indicates a need to improve information, education and communication about forests and their management, and a need to explain the synergies and trade-offs between different forest ecosystem services related to various management practices.

These findings are certainly relevant to New Zealand, particularly in relation to the potential benefits of mixed-species, continuous-canopy forests that can deliver a wide range of ecosystem services and recreation values and permit low-impact harvesting of high-value species, both indigenous and exotic.

In summary

The purpose of this paper is to explore the relationships that communities have with forests and their desires to contribute to their governance opportunities.

At the heart of many community relationships with forests has been the desire to ensure that the physical resources the forests provide are managed with a long-term view – in reality, many human generations.

Over the last 200 years, New Zealand has had a massive transition from indigenous old-growth forest exploitation to establishing and harvesting from exotic plantations. So now we have a very binary forest scene: largely fully

[11] https://efi.int/forestquestions/q3, accessed 21 Oct 2023.

[12] Dixon, Rachel. 2023. The Norwegian secret: how frilusftsliy boosts health and happiness. The Guardian. https://www.theguardian.com/lifeandstyle/2023/sep/27/the-norwegian-secret-how-friluftsliv-boosts-health-and-happiness, accessed 21 Oct 2023.

protected, indigenous forest lands and a monocultural, exotic forest production system based largely on clear-felling. Today the vast majority of New Zealand's wood products are derived from radiata pine forests with an almost total lack of any mixed-species/mixed-use forest such as those dominant throughout Europe.

This raises two questions:

- Is there a place for the expansion of multi-use forests in New Zealand?
- Is there value in expanding more direct community involvement, both strategically and operationally, in all local government-owned forests, such as those owned by NCC?

Such expansion and community involvement would serve to strengthen the opportunities for improved biodiversity outcomes of indigenous forest areas, and could enable and empower more creative transitions of NCC's current commercial forest areas to permanent and continuous-canopy forests.

New Zealand's engagement with its Gondwana forests has become increasingly protection oriented, as manifested in the early establishment of national parks, wildlife recovery programmes (beginning with extinction recovery work), and now many fenced sanctuaries and massive pest-control efforts.

More and more, the focus on saving our wildlife, in all its great diversity, has been led by community efforts – most involving volunteers and a not-for-profit trust of some form. The role of volunteers, in trusts and directly supporting local and central government (i.e. DOC) initiatives, has been at the heart of communities engaging with their forests. And 'directing the needed effort' over the longer term is something communities have increasingly taken on. Interestingly, this commonality of effort and desired outcome is found in diverse collective structures and partnership models.

These New Zealand trends in organised community engagement mirror patterns in the EU, with its vast number of smaller forest holdings, many in community ownerships going back centuries. Increasingly, forests are being more highly valued for their environmental services, amenity values and non-timber resources.

The body of evidence, both in New Zealand and internationally, is that community recognition of forests' many values is rising, as is the desire by the community to be involved in forest management and care. Hence, we have the rise of community trusts that have given birth to successful sanctuaries and massive pest-control efforts. Additionally, there is increasing recognition and empowerment of the kaitiakitanga rights and responsibilities of tangata whenua. Clearly, there is a strong and well-documented case for more structured input to the management of, and care of, NCC's 10,000+ ha of forest estate.

Accordingly, it is recommended that:

Future governance and management of NCC's forestland should include an independent community entity to maintain local tangata whenua and intergenerational input, and to facilitate private and public investment in all future forest management.

Evolving ecologies –

community aspirations, forest transition options & challenges

Lead author: Andrew Fenemor

Co-authors: Joanne Clapcott & Rachel Sanson

Executive summary

This review presents research arising from a comprehensive exploration of transitioning the Whakatū Nelson, Nelson City Council production forest estate from current plantation forestry practices to alternative systems. It aligns forest types with a vision emphasising environmental, social, cultural and economic values, alongside climate resilience. Key values, including economic considerations, water supply protection, biodiversity preservation and recreational use, are highlighted, forming the foundation for informed decision making.

The forest cover scenarios encompass refined management practices, continuous-canopy selective timber harvesting, mixed amenity forests, and indigenous forest restoration, each with its unique benefits and challenges. Considerations include ecological, financial and community perspectives, with an emphasis on balancing viability, sustainability and community values.

The estimated transition costs range from $2,500 to $40,000/ha, depending on factors like approach, planting density and stand condition. These costs can be spread over time, and potential savings may be achieved through gradual transitions and alternative reforestation techniques.

Ultimately, the decision-making process will involve careful consideration of benefits, costs, community input and compliance with local and national regulations. Consulting with experts and stakeholders will be crucial in navigating this complex transition towards a more sustainable and resilient forest estate.

Introduction

There are many ways people are linked with the natural environment and this human–nature relationship can change over time. In Whakatū Nelson, this evolving ecology is responding to the availability and sustainability of natural resources, peoples' preference for scenes dominated by natural elements, and the health benefits and well-being associated with engaging with nature. The Nelson City Council (NCC) forest estate is a core element of the human–nature relationship in Te Tauihu, and hence the management of the estate is and should be shaped by human values. Key questions are, for example, what do people envision for these lands, now and in the future?

This review is in three parts. Part 1 summarises stakeholder values[1] and aspirations for the c. 600 ha of NCC exotic forestry lands as part of the 10,000+ ha NCC forest estate.

Part 2 identifies options, and how they might be delivered, for transitioning to alternative forest covers that will, in the long term, better deliver those values and

[1] Values includes uses as well as ‘ways that matter’ (Sinner, Fenemor et al. 2011).

aspirations. It addresses the questions: what sorts of forests and species, and what sort of forest management, should be practically considered?

Part 3 contains conclusions and recommendations drawn from Parts 1 and 2 and relevant to forest transitions on NCC's lands.

This 'transitions' review is the fourth (#4) of four review papers that together provide the framework for decision making within the four forest catchment areas: the Maitai, Brook, Marsden and Roding.

Paper #1, on strategic planning, proposes a more structured approach to NCC decision making for the future management of NCC's forestry lands.

Paper #2, on economics, reviews the actual costs and revenues from NCC's exotic plantation forestry and suggests that, contrary to expectations, many of NCC's forestry stands are not profit-making.

Paper #3, on governance, points to opportunities for community involvement and improved governance for the delivery of the aspirations held for these and adjacent NCC lands.

Thus, Paper #4 is a review of what future land uses could be considered, and how they might be delivered. Together those changes required represent an evolving ecology comprising people, biodiversity and landscapes, as the title suggests.

Part 1: Values and aspirations

People of Whakatū Nelson have multiple values associated with the forest estate. Drawing on community forums and consultations, including our own, we have a growing understanding of what Nelson communities and sector groups cherish about the forests in our public conservation and landscape reserves. These can be summarised: as environmental (e.g. air, soil and water quality, flood and sediment control, ecosystem services), social and cultural (e.g. amenity, spiritual, recreation) and economic values (e.g. net revenue from productive use, tourism and recreation, opportunity costs) as well as cross-cutting values such as kaitiakitanga, biodiversity enhancement and climate resilience.

The aspirational statement of the Right Tree Right Place (RTRP) Task Force summarises a future vision for the NCC forests estate:'A resilient permanently forested landscape, rich in biodiversity, that supports the many values of the people of Te Tau Ihu and our future generations'.

Given the many aspects of forests that we value, one of the big challenges is reaching agreement on which forest type(s) can best achieve agreed values. Forest options, which provide for identified values, come with benefits and opportunities and conversely with costs and risks, some of the latter due to our rapidly changing climate – as evidenced already by wildfires and flood damage.

This challenge is addressed in part with a strategic planning process (see Paper #1) and also here, where we consider what science and experience-on-the-ground tell us.

Summary of values and aspirations for NCC forest lands

Nine high-level values have been identified by Catalyst (2016) as being associated with NCC's production forests, and present across the entire production forest estate. Many of these values are in direct conflict (incompatible) with production forestry. These values are listed below together with further commentary:

1 *Production forestry economics*

A primary rationale for NCC's original investment in production forestry has been income generation, potentially to subsidise rates. However, Paper #2 reveals that the Return on Investment (ROI) of some current plantation pine stands is negative. The 27-year harvest cycle ROI (actuals and projected) across the estate is projected to be 1.64% (including revaluations), 0.87% (excluding revaluations).[2] Some stands are simply difficult to harvest without significant cost, while others produce good quality and accessible logs.

2 *Municipal water supply protection*

Parts of the Maitai and Roding forestry blocks drain into city water supplies so it is a priority to maintain water quality at those intakes. While these terrains are relatively stable compared to other parts of New Zealand, there are many steep areas subject to an increased risk of surface erosion and landsliding in the water supply catchment areas (Maitai South, Maitai North, Roding) for up to 6–8 years[3] following clear-felling.

[2] NCC Finance Team spreadsheet, 2004–22 actuals and 2023–31 projections (linked, accessed 27 Oct 2023).

[3] Recent research from Manaaki Whenua indicates the window of vulnerability for landsliding following pine forest clear-felling is 4–6 years (Chris Phillips, pers. comm.).

This risk can be partially mitigated by maintaining riparian buffers adjacent to waterways (Fenemor & Samarasinghe 2020).

3 *Infrastructure protection*

Assets within or downstream of NCC forestry lands include power lines, the Marsden transformer (critical for regional electricity supply), publicly used roads and tracks, the Maitai water main, the Roding intake and weir. These all require protection from climate-related damage and are currently managed with variable success (e.g. the Maitai water pipeline severed in August 2022), using buffer zones and closures.

4 *Landscape amenity*

In terms of important landscapes within the forest catchments, an NCC review identified 'visual amenity landscapes' as overlapping the existing Marsden and Brook forests, with 138 ha on Barnicoat Range and 61 ha on Fringed Hill (Boffa Miskell 2015), and Dun Mountain and the Upper Maitai catchment as an 'Outstanding Landscape' in the context of the NCC area. The Maitai River within the Maitai Valley and Upper Maitai landscape character areas are considered to form a 'Significant Landscape'.[4] The larger Bryant Range (which includes the Mineral Belt), Roding Valley and the Northern Bryant Range (containing Mount Richmond Forest Park) is considered to form an 'Outstanding Natural Landscape'.[5] Identified threats include: permanent clearance of vegetation and changes in land use which detract from the 'green' backdrop character and extensive earthworks and/or tracking, which changes the line and form of the mountain backdrop.

Considering the duration from plantation harvest to canopy closure of a subsequent rotation, the appearance of the landscape is changed for nearly 10 years of a 25–30 year forestry cycle. For some, the appearance of monoculture forestry cover affects visual amenity for the whole forestry cycle.

5 *Residential development buffering*

Increased housing demand brings residential development close to forestry areas and this increases fire and erosion risk (eg. properties impacted by slips from harvested slopes in the Brook, August 2022). With people and homes being closer, harvests need to be managed better. Recent examples where this will be necessary are the planned Kaka Valley development in the Maitai Valley and the Montebello and adjacent housing developments in Marsden Valley. Catalyst (2016) suggests it is not viable to have tall trees within 200 m above houses. Additionally, logging truck movements present safety and management challenges.

6 *Archaeological sites*

Smith's grave site in the Maitai Valley is the only documented archaeological site within the forestry area, and pre-European discovery protocols haven't found anything during forestry harvest cycles.[6] Associative values identified[7] for the Maitai are: historic association with argillite resources used by Maori; an original travel route between Nelson and Pelorus/Marlborough. And for the Roding a value is: a historic association with early copper mines including the now abandoned Champion Smelter.

[4] Draft Whakamahere Whakatū Nelson Plan October 2020. Part 6. NFL. APP38 (linked here, accessed 27 Oct 2023).
[5] Boffa Miskell. Nelson Landscape Study 2016. Landscape Evaluation. p22. (linked here, accessed 27 Oct 2023).
[6] Sites of significance to tangata whenua have not been identified publicly.
[7] Boffa Miskell. Nelson Landscape Study 2016. Landscape Evaluation. p39.

7 *Recreation and tourism*

Walking and mountain biking are very popular and demand from a range of users continues to increase and evolve (e.g. e-bike uptake on trails), especially in the Maitai, Brook and Marsden catchments. However, use and access, and expansion and maintenance of the track network are constrained and negatively impacted by forestry operations, particularly by closures from storm damage and increased fire risk. A key challenge is to provide sufficient track capacity for separation of use where possible (e.g. walker-only tracks), and for less skilled and agile users who need Grade 2 or low Grade 3 cycle trails.[8]

Closures during harvest, due to increased fire risk, or for track repairs following storm damage (their timing, notification, and duration), create uncertainty both for community and commercial users, which has significantly reduced regional tourism income.[9] Paragliding on the Barnicoat Range above Marsden forests is sometimes limited by forestry activities and is subject to a buffer zone and managed road closures.

8 *Water quality protection*

Risks to water quality are from sediment, nutrients and other contaminants such as chemical sprays. For sediment loss to water, the forest estate is generally stable apart from surface runoff of fine sediment when ground is disturbed. Codgers Hill to York Valley is an exception, with less stable land than other areas. Riparian buffers[10] and other contaminant-retention actions such as sediment-retention ponds and cutoff drains can reduce the amount of sediment that actually reaches a water body.

A 2017 NIWA study[11] prepared for NCC

> *indicates that plantation forestry blocks, whether recently harvested or covered in gorse and broom, are contributing a substantial amount of sediment to the Maitai River, and to the tributaries draining into the river in the upper and middle reaches. For example, deep scarring associated with the pine harvest and hauler lines on steep hill slopes in the Brook Stream subcatchment produces almost 20% of the sediment in the lower Maitai River. Areas of mature production forest and native forest are unlikely to be producing substantial amounts of sediment runoff during rainfall events due to extensive leaf canopy protecting the soil from the erosive energy of the rain drops.*

Urlich (2015) reviews sediment control options for forests in the Marlborough Sounds; options relevant to NCC's forest catchments include:

- trees to be planted back from stream edges 5–10 m, depending on stream size (this is potentially superseded now by updated NPS requirements)
- controls of replanting on steep slopes where areas at high risk of erosion have been identified, and which require retirement and implementation of buffers, such as gully heads and steep ephemeral gullies
- replanting requirements that reduce the window of vulnerability:

  i) harvested areas to be replanted within 12 months of harvest

  ii) replanting density to be more than 1000 stems/hectare

[8] See NCC Out and About On Tracks Strategy 2022 (linked here, accessed 27 Oct 2023).
[9] McIndoe C., Rahman M., and Dixon H. (Sep 2023). Mountain biking – the economic opportunity and risk for Nelson Tasman. BERL. (linked here, accessed 27 Oct 2023).
[10] Catalyst (2016) recommends a buffer of 10 m; Fenemor and Samarasinghe (2020) suggest 15 m in the absence of site-specific assessments.
[11] NIWA. 2017. CSSI-based sediment source tracking study for the Maitai River, Nelson. (linked here, accessed 27 Oct 2023).

- all woody material >100 mm in diameter and > 3 m in length to be removed from gullies (where the area harvested was > 5000 m^2 or 0.5 ha) as soon as possible after harvest
- all areas of loose fill (i.e. soil) to have a grass cover established within 12 months of being created unless covered by natural revegetation.

A Landcare Research review of Urlich's work (see Urlich 2015) also suggested limiting the size of harvested areas within a forestry stand, and planting alternative species such as coppicing species in erosion-prone areas such as gully heads.

9 *(Indigenous) Biodiversity*

Catalyst (2016)[12] identified no Significant Natural Areas (SNAs) within NCC's production forests. Subsequent mapping identifies

> *Two areas within the [Marsden] Reserve have been assessed for ecological significance and subsequently deemed Significant Natural Areas (SNA). A very large (c. 8000 ha) hinterland SNA includes the intact mature portion of Marsden Valley Reserve. The sheer size, intactness, altitudinal range, varied geology and topography score very high for significance (North, 2008). A second, much smaller (c. 1 ha) SNA along Orphanage Creek scores moderately across a range of criterion including ecosystem rarity and distinctiveness (North, 2016). A large portion of the upper Poorman's catchment which is intact mature red beech-kāmahi forest has been designated in the top 30% of sites in an integrated Nelson-Tasman ecosystem prioritization of biodiversity value (Leathwick, 2019).*[13]

An area of SNA 89 within the Roding production forest has been identified.[14] Additionally, there are SNAs adjacent or in close proximity to all catchments (e.g. the Bryant ecological district adjacent to the Roding production forest), encircling some production forest stands (Maitai), and there are stands of mature native vegetation within production forests. Notably, the Brook, Marsden and Maitai production areas sit within the Core area of the Nelson Halo (an area of biodiversity enhancement), while the Roding production forest is within the Nelson Halo Hinterland area.[15]

Spread of wilding trees is a risk, which is greater for Douglas fir than radiata pine (*Pinus radiata*), especially on ridgelines like in the Barnicoat Range and the mineral belt beyond. There are currently 39 ha of Douglas fir on the Barnicoat ridgeline for which harvest was delayed to allow a commercial return (Catalyst 2022).

Clear-felling can also damage residual and regenerating indigenous vegetation, habitat and nests for indigenous birdlife (e.g. falcons). Recent research on transitioning of 2300 ha of the catchments of the Hunua water supply, out of pine, suggests that thinning pines to as low as 150 stems/ha where there is plentiful indigenous seed or understorey can be a cost-effective way to transition to indigenous cover (Rhys Millar, Ahika Consultants, pers. comm.).

To this list of values we would add:

[12] Catalyst. 2016. p25.
[13] Kaitiaki O Ngāhere (2021). Marsden Valley Reserve Ecological Restoration Plan, 2021–2030. p8. (linked here; accessed 27 Oct 2023).
[14] NCC Boundary Adjustment SNA 89 overview map, https://tinyurl.com/4vj7axb4, accessed 27 Oct 2023.
[15] http://www.nelson.govt.nz/environment/nelson-nature/natural-environment/the-nelson-halo/, accessed 27 Oct 2023.

10 *Climate change resilience*

Nelson faces increased risks of flooding, landslides, drought and fire. There are opportunities for permanent forest cover to contribute to flood resilience (by providing natural infrastructure) and the region's emissions reduction goal of net zero by 2050.

The region can expect 10–40 more heatwave days above 25ºC by 2090, less frost, more fire risk, increased heavy rainfall (including from ex-tropical cyclones) as well as worse droughts.[16]

Analysis of current rainfall and river flows for the four forest catchments is summarised below.[17]

Rainfall: Long-term records show that the highest mean and storm rainfalls occur in the Brook at Third House (1983 mm annually), then at Maitai Forks (1700 mm) then the Roding Caretaker's (1435 mm) then Orphanage Creek at Ngawhatu (1015 mm). Rainfall increases with altitude and aspect, so we expect higher overall rainfall in the higher-altitude upper Roding and upper Maitai catchments due to the orographic effects of prevailing northerly storms. Droughts with no rain for at least 28 days will become increasingly frequent with climate change.

River flows: Highest average river flows occur at the Roding site above the caretakers house (1731 L/sec), then Maitai below the dam (1552 L/sec; affected by upstream water taken), then the Brook (387 L/sec), then Orphanage Stream (88 L/sec). Flow generated per square kilometre is higher in the Maitai and Roding (at about 45 L/sec/km^2 annually) than the lower Brook (24) and Orphanage Stream (11), reflecting the higher-altitude rainfalls mentioned above.

Cyclone Gabrielle in the North Island east coast shows that we can expect more problems with forestry debris with climate change. Interpine (2023) reports that 48% of woody debris deposited in Hawkes Bay from Cyclone Gabrielle came from plantation pine, including 4% from harvest slash.[18] Hawkes Bay Regional Council commissioned an assessment of woody debris that showed significant variation in species composition across the sites, from 5% to 90% pine.[19]

A recent study on Tasman's Separation Point Granite terrain near Riwaka (Griffiths et al. 2020) showed that land cover, elevation, rainfall, slope, and aspect were the strongest predictors of landslides, with the land-cover classes seral indigenous vegetation (immature and shallow-rooted) and clear-felled plantation forest being those predicted to have higher probabilities of landslides. Tall indigenous forest and closed-canopy plantation forest showed lower probabilities of landslides. We can expect more debris in total as climate warming progresses.

11 *Freshwater and estuarine ecosystem health*

Contaminants including sediment affect not just streams but Nelson Haven, Waimea Inlet, Delaware Bay and Kokorua, where increasing levels of intertidal mud are being seen (SALT Ecology presentation to NCC, pers. comm.).

[16] 23570-TDC-Climate-Change-Impacts-Flyer-Update-Mar23-Proof-2.jpg (3508×2480) (tasman.govt.nz; accessed 27 Oct 2023); A. Fenemor in *Waimea Weekly* – 16 August 2023, accessed 27 Oct 2023.

[17] Analysis by Andrew Fenemor based on data provided by Callum Chisnall, NCC (August 2023).

[18] Cyclone Gabrielle – Post Event Woody Debris Assessment, Hawkes Bay, Prepared for Hawkes Bay Forestry Group by Interpine, 24 April 2023.

[19] https://www.hbrc.govt.nz/assets/Document-Library/Cyclone-Gabrielle/Post-Cyclone-Gabrielle-2023-large-woody-debris-assessment-31.03.2023-FINAL-v1.pdf, , accessed 27 Oct 2023. p42

Freshwater invertebrates and fish are impacted by sediment smothering streambeds, increased water temperatures when shading is removed, and restricted movement due to culverts, unless mitigations such as well-planned stream crossings and riparian buffers are maintained. Similarly, seagrass beds and the ecosystems they support can be negatively impacted by increased sediment and contaminant loads.

12 *Kaitiakitanga*

Tangata whenua bring a holistic and intergenerational approach to relationship with, and stewardship of te taiao (the natural world), that is based on a Māori worldview. Kaitiakitanga supports broader outcomes resulting from a healthy, reciprocal people–nature relationship, such as the cultural values of mahinga kai, mauri and whakapapa. Kaitiaki are appointed by local mana whenua and follow specific tikanga and kawa (customary practices). An important element of kaitiakitanga as a 'value' in the forests around Whakatū is the ability of local iwi to exercise these responsibilities.

13 *Social values*

Nelson's landscape and conservation reserves, including the areas currently in production forestry, have significant social value to the community, including contributing to health and well-being outcomes, spiritual and nature connections, educational opportunities, community building through shared action, and a sense of identity and connection with place.

14 *Broader economic outcomes*

A broader view of economic returns and opportunities is critical, including non-pine timber, honey leases, recreational tourism,[20] 'permanent' forest Emissions Trading Scheme (ETS) credits[21] and biodiversity credits. Important to acknowledge is that mountain biking contributes c. $30m per year to the region, but the amount could be significantly more (c. $20m more per year) if access to recreational trails on NCC land was not being restricted through plantation forestry activities and associated impacts.

This list of 14 values provides a basis for assessing the extent to which future land-cover options in each of the four major catchment forest areas could ultimately achieve these high-level values.

Summary of responses from 'Interested party' sessions

The following three sections summarise the values, aspirations, and transition approaches as expressed by interested parties, technical experts and NCC staff in a series of workshops convened by the Task Force in July–August 2023. Iwi were invited to appoint a representative to the Task Force, and additionally invited to an iwi-engagement session, but were unable to take up these invitations. A briefing meeting was held with Ngāti Koata as a major adjoining landowner in the Maitai Valley.

Meetings with 'interested parties' were convened by the Task Force on 5 July and 1 August 2023, to canvas community views on what is most valued in our forested lands and what are considered as risks. The same questions were discussed by both groups. Following is an aggregation of the views expressed.

[20] BERL.(Sep 2023). Mountain biking – the economic opportunity and risk for Nelson Tasman.
[21] Refer to NCC Forest Carbon Opportunities Report 2022, Ekos. (linked, accessed 27 Oct 2023).

Values of NCC's forested areas:

Recreational access and diversity: Easily accessible forested areas catering to diverse recreational activities, which are currently impacted by access closures and damage during clear-felling.

Cultural and environmental significance: Importance of indigenous areas for cultural practices, clean water supply and intergenerational planning.

Biodiversity and well-being: Emphasis on supporting indigenous species, mental and physical well-being.

Economic considerations: Recognising economic potential in tourism, recreation (especially mountain biking and paragliding), carbon forests and timber, whatever forest types are chosen.

Current model: Externalises many social and environmental risks and costs. Options to reduce these risks include limiting the area of clearcut harvesting, planting alternative exotic and/or indigenous species, use alternative felling, extraction, and sales options for timber.

Preferred forest types:

Mixed species (vs monoculture) preferred: Preference for mixed-species forests for lower maintenance and better track preservation. Some interested parties favoured solely transition to indigenous forest, while others suggested specialty timbers such as tōtara and redwood as well.

Consider planting for specific goals: Choose forest types based on erosion control, carbon sequestration and ecological functioning (such as establishment of corridors of indigenous vegetation adjacent to SNAs, and species which attract and/or sustain birdlife).

Biodiversity and resilience: High value placed on indigenous species for biodiversity and ecological resilience.

Risks to forest types and lands:

Erosion and sedimentation: Concerns about erosion, sedimentation and runoff into rivers and bays, especially associated with clear-felling of plantation forests.

Fire risk and climate change: Wariness of fire risks, particularly with flammable species, and especially when considering climate change.

Biodiversity loss: Risks associated with monoculture and clear-felling, emphasising the need for diversity in forested landscapes.

Access restrictions and economic impact: Concerns about restricted access and closures of valued recreational areas, due to forestry operations and fire risks, with economic implications.

Desired relationships between NCC, the community and groups:

Community involvement: Strong desire for community involvement through education, volunteering and partnerships with stakeholders.

Strategic planning and governance: Need for strategic planning and governance structures involving NCC, community groups, iwi, and experts.

Education and collaboration: Critical importance of education involving schools and community groups, and collaboration with experts, trusts and organisations.

Additional comments:

- Noteworthy expansions in indigenous planting are being observed owing to birds spreading seeds.
- Caution was expressed regarding clear-felling large areas due to potential risks during heavy rain events.
- There was emphasis on the responsible management of cleared lands.
- Visible and accessible areas for community engagement and activities were a focus.
- Concern for careful sequencing of transitions from pine to optimise returns and stage the costs.
- Protection of air and water quality is considered paramount.
- Long-term planning and budgeting for maintenance are seen as crucial for success.
- School involvement in planting activities are viewed as a potential community-building opportunity.
- Cost estimation and financial planning were identified as key decision-making considerations.

Views from consulting technical experts

A session with technical experts was held on 31 August 2023. Topics discussed related to transitioning from clear-felling production forestry to continuous-canopy and permanent afforestation. A summary of the key points follows.

Invasive pest plants and pest control:

Participants highlighted the challenges of managing invasive pest plants like old man's beard, banana passionfruit vine and gorse, and of dealing with the presence of deer and pigs. The cost of effective pest control was discussed.

Sediment issues and vegetation:

Addressing sediment issues was emphasised, with the suggestion to leave land vegetated. The importance of indigenous seed sources and weed control was mentioned. A strategy involving indigenous seed islands and controlled poisoning of pests was proposed.

Long-term focus:

There was a call to shift the focus from short-term financial gains to long-term considerations, with a suggestion to plan for a 100-year timeline.

Diverse tree species and working with nature:

Participants recommended transitioning from single species forests (monoculture) to forests of several types of trees, and advocated for working with natural processes. This includes managing pest control at a larger scale than currently and increasing the diversity of the understorey.

Soil and water considerations:

Clear-cutting on steep terrain was identified as problematic, and the importance of high-value species for economic viability on steep slopes was noted. Soil and water issues were discussed as significant challenges.

Harvest planning and infrastructure:

Planning for harvest and consideration of infrastructure obstacles were mentioned as critical aspects of the transition.

Innovation and technology adoption:

There was a call to reconsider current methods and adopt innovative approaches, particularly in the context of continuous-canopy models. The use of technology for more sustainable forest management was highlighted.

Species selection and climate considerations:

Choosing appropriate tree species for a changing climate was discussed. Participants emphasised the need for species that can thrive in hotter, dryer and at times wetter conditions.

Biodiversity and resilience:

The importance of a diverse forest for resilience and stability, as well as its benefits for preventing slope failure, was emphasised.

Site-specific planning:

The discussion highlighted the need for site-specific planning, taking into account factors such as soil type, slope, aspect and pests.

Fire risk and risk mitigation:

Fire risk in different areas of the forest was discussed, and strategies for mitigation were considered. The potential of different tree species in mitigating fire risk was mentioned.

Financial considerations and budget planning:

The cost of plantings, including factors like species selection, location and soil conditions, was a significant consideration. Budgeting for transitions, especially in the face of potential delays in harvest, was also discussed.

Community and stakeholder engagement:

Engaging with the community and stakeholders, as well as considering their values and interests, was identified as important for successful transition.

Overall, the discussion was broad, reflecting the complexity and multifaceted nature of transitioning from clear-felling production forestry to a more sustainable and ecologically diverse forest model. It's evident that careful planning, innovation and a long-term perspective are key factors in this transition process.

Perspectives from NCC

We heard from the Science and Environment, and the Parks and Recreation teams within NCC regarding key considerations in regard to production forestry in Council's landscape and conservation reserves, and the factors to consider in transition planning. Summaries of these follow.

Science and Environment team

Biodiversity and biosecurity:

- Council-adopted biodiversity strategies emphasise protecting natural ecosystems and restoring ecological connections.
- NCC plantations are located within or adjacent to indigenous forests with high biodiversity value.
- Plantation forestry can have negative impacts on wildlife habitat and biodiversity, acting as an ecological sink.
- Issues include fragmentation of indigenous ecosystems, ecological connectivity, and threats from wilding pines, weeds and pest animals.

Erosion and sedimentation:

- Erosion susceptibility is based on factors like geology, slope and vegetation cover.
- Highly erodible land should be under permanent vegetation cover to reduce erosion risk.
- Forestry on highly erodible land requires stringent sediment controls and may be considered for retirement.
- Land stabilisation measures may be needed during forest transition to reduce erosion and sedimentation risks.

Freshwater:

- Exotic forestry activities can impact freshwater quality, including increased stream water temperatures and benthic algae.
- Forestry contributes to fine sediment loss to streams, affecting macroinvertebrate communities and fish spawning habitat.
- Forestry-related sediment and nutrient loads may promote cyanobacteria (toxic algae) and impact ecosystem metabolism.

Estuarine and marine environments:

- Sedimentation is an emerging issue in estuarine and marine environments, with forestry likely being a contributing factor.
- Nelson estuaries are classified as 'moderately impacted' in the New Zealand Estuary Trophic Index due to their high mud content.

- Increasing muddiness is observed in the region, potentially limiting survival of species like cockles.
- Fine sediment is smothering seagrass beds, leading to a decline in seagrass area.

The Science and Environment team supplied a mapped assessment of areas to be prioritised for transition (linked here; accessed 27 Oct 2023).

NCC is working towards giving effect to Te Mana o te Wai while implementing the Essential Freshwater package. Key factors include a hierarchy of obligations, which prioritises the well-being and health of the water first. Ecosystem health, Threatened species and mahinga kai are compulsory values. Others are: actively involving tangata whenua in freshwater management, and valuing Mātauranga (indigenous knowledge); taking a 'mountains to sea' approach; and noting 'it is everyone's responsibility to stop degradation at source.'[22]

Parks and Reserves team

Transition process and protection status:

- No formal process currently exists for transitioning management from forestry to parks.
- There is no change in protection status during this transition (the land is already designated as landscape or conservation reserve).

Long-term management plans and considerations:

- The Team prioritises recreation and conservation in its long-term management plans.
- Risks during transition include issues like vine weed incursion, drought, pest animals and fire risk.

Pest management and stakeholder engagement:

- Pest management involves costs for the control of ungulates (goats, deer), pigs, possums and vine weeds.
- Community volunteer involvement is limited owing to the extent and terrain of the land.

Budgeting for land-use transition:

- The Team budgets for various types of land-use transition based on factors like planting costs, maintenance and terrain.
- Differences between actual expenditure and budgeted expenditure have been satisfactory, but capacity to accommodate greater differences is also a concern.

Recreational-use levels and trends:

- Marsden experiences high walking use and some biking and paragliding.
- Brook is primarily bisected by the Dun Mountain Walkway and Coppermine Trail, both popular recreational routes.

Pest management is a significant factor when planning forest transition, let alone simultaneously attempting to maintain existing biodiversity.[23] Scientific evidence suggests that the culling of ungulates results in favoured plant species becoming more

[22] NCC Freshwater Management Units workshop presentation, Sep 2023.
[23] Leigh Marshall & Phil Cochrane. Memo to RTRP Task Force on pest animals in Council's Conservation Reserves, Sep 2023.

favoured by the remaining animals, therefore complete removal should be the target in sensitive areas (Wright et al. 2012). Vegetation monitoring 2013–18 showed that at current numbers, ungulates continue to suppress indigenous regrowth in the Maitai and Roding reserves (Sweetapple 2022). Moderate to high possum densities were also observed in monitoring during 2020.

NCC's Backcountry Ungulate Management programme, in operation since 2010, aimed to reduce ungulate numbers in the Maitai and Roding reserves to near zero by now but the programme has had insufficient funding and hunter effort to reduce deer and pig numbers despite some success with goat culling. Costs have equated to $135–$200 per animal culled (Wildlife Management Associates 2023). We support a wider landscape-based approach to ungulate control and working with, for example, DOC, Ngāti Koata and private landowners to support forest transitions.

Summary of values and aspirations

Table 1: 14 relevant considerations when weighing values for NCC's forest estate

1	Production forestry economics
2	Municipal water supply protection
3	Infrastructure protection
4	Landscape amenity
5	Residential buffering
6	Archaeological sites
7	Recreation and tourism
8	Water quality protection
9	Biodiversity enhancement
10	Climate change resilience
11	Freshwater and estuarine ecosystem health
12	Kaitiakitanga
13	Social values
14	Broader economic opportunities

Engagement with interested parties, technical experts and NCC staff showed a strong preference for transition to alternative mixed-species forests – with some strong preferences for indigenous biodiversity – tailored to reducing risks from erosion, fire, climate warming, biodiversity loss and pests, while improving recreational access.

Preferences were expressed for budgeting a staged transition, maximising land cover (meaning smaller harvest areas if further harvests are planned), improved ecological connectivity and community participation in planning for these changes. Drawing on existing transition experience was strongly supported as was a long-term (perhaps 100 year) planning horizon for achieving permanent tall-canopy reforestation.

Part 2: Options for forest transition

Transitions in overview

One of the purposes of the RTRP Task Force (TOR 2023) is to

> *draw on the high-level forestry review reports, other relevant research data and stakeholder views to provide recommendations for future land use and management of Council-owned land currently managed for production forestry.*

To transition from current practice to an alternative forest system requires consideration of many factors, as outlined in the TOR 2023, including:

- a range of climate change and adaptation matters
- conservation benefits
- the financial implications and opportunities for NCC and the Nelson–Tasman economy
- recreational benefits for a variety of users such as walkers and mountain bikers
- meeting national and regional regulations, and guidelines associated with exotic forestry, particularly around the spread of wilding pines
- effects on Nelson's biodiversity
- landscape and aesthetic benefit from a backdrop of permanent indigenous forest or amenity land cover compared to a land cover of short-rotation commercial forestry
- social licence to undertake production forestry in the urban fringe.

A useful high-level process for planning forest transitions is shown in Figure 1, highlighting the importance of landscape factors alongside desired goals ('values' in the discussion above) and available resources such as funding and expertise.

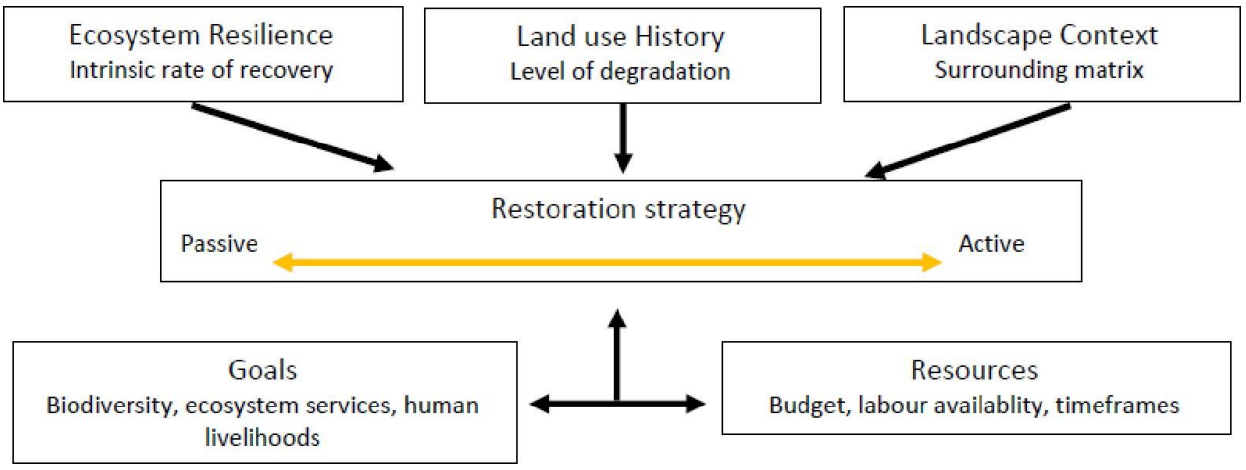


Figure 1: Factors to be considered when planning transition strategies (Holl & Aide, 2011).

Forbes (2021a) expands this schema by turning it into the following five steps when planning clear-felling restoration, which is relevant to the Task Force evaluations.

1 Goals –goals defined in consultation with stakeholders

- Restore tree cover
- Restore a biodiverse mature forest composition

- Restore cultural values
- Improve carbon storage
- Use practices that conserve the soil
- Provide and/or enhance employment or income
- Educate stakeholders and the public
- Grow indigenous timber
- Reconnect people with the land
- Ecosystem resilience – the intrinsic ability of forests to recover rainfall regime and/or soil moisture
- Temperature
- Landform
- Soil quality
- Tree species traits
- Dynamics between desirable and undesirable plant species.

3 *Land-use history – the level of degradation*

- Intensity and duration of past land use
- Availability of indigenous propagules within clear-felled areas
- Retention and intactness of embedded or adjacent remnant indigenous ecosystems
- Level of soil degradation (e.g. compaction, topsoil loss, altered soil hydrology)
- Crossing of abiotic or biotic thresholds.

4 *Landscape context – positive and negative influences from the surrounding landscape*

- Amount and configuration of adjacent indigenous forest seed sources and disperser habitats
- Disturbance sources from the landscape (e.g. invasive plant or animal species, fire).

5 *Resources – financial, human and intellectual*

- Understanding actual restoration costs
- Accessing funding (amount and timeframes)
- Availability of people to implement restoration interventions
- Access to accurate restoration knowledge.

There is a growing literature on forest transitions in Aotearoa New Zealand, a literature that is highlighting the challenges inherent in moving from clear-felling of radiata pine forests to other land cover and forest management options. We can learn much from forest transitions underway locally (e.g. Silvan and Kingsland forests), and around the country (e.g. Hinewai Reserve), while keeping in mind the differing challenges across terrains, climatic zones, species mixes, and weed and pest infestations. A key factor to consider is the issue of the scale at which transitions are planned, as some forest areas have such varied character that a mix of land-cover options may be more successful than a single land-cover choice.

Notable in both the Silvan and Kingsland forest approaches to forestry transition and reforestation in permanent-canopy indigenous and exotic species are: a long-term (200-year) strategic vision of the desired landscape outcomes; thorough whole-of-catchment and/or -landscape planning, including GIS mapping and future species rendering, to develop a comprehensive and cost-effective plan for reforestation (refer Boffa Miskell planning for Silvan Forest, and the Kingsland Forest plan).

Tane's Tree Trust (Meg Graeme, pers. comm.) summarise the following as primary considerations for determining the appropriate transition pathway:

- Required carbon absorption rates over short- and long-term timeframes
- Biodiversity gains
- Catchment risks (Land Use Capability classification) and restoration gains (sediment control, flood reduction, summer stream supplies)
- Resilience to fire, drought, disease and wind.

Site-specific considerations include climate variability, availability of diverse indigenous seed sources, pest animal and plant threats, and land-stability risks.

We identify a range of options for transitioning from plantation forestry to alternative land covers, as well as the option of continued plantation forestry in the short term, albeit with potential changes to the current extensive clear-felling harvest regime. We recognise that there is not necessarily a best alternative land-cover option but instead summarise information on values, opportunities and risks to make recommendations, while maintaining choice for the long term.[24]

Scoping land-cover options

The land-cover scenarios that follow are of necessity broad-scale options, when may be better to take a more nuanced approach to the landscape context which, for example, treats gullies, riparian buffers, south-facing versus north-facing slopes, and different soils and geologies differently.

In this review, and in our four catchment reviews where we recommend a primary forest cover (i.e. climax cover of emergent and/or mid- and tall-canopy species) for each identified forest stand, we assess four potential forest-cover scenarios

(1) Plantation forestry (*Pinus radiata*):

   a. Mature harvest transition, with updated best management practice (e.g. reduced harvest size, weed and pest control, improved riparian buffers), while planning for transition to option 2, 3 or 4 after harvest; or

   b. Active transition, before maturity (e.g. chemical thinning or felling) to options 2, 3 or 4.

(2) Alternative continuous cover timber species (indigenous and/or exotic)

(3) Mixed indigenous and exotic amenity forest-tree cover

(4) Indigenous forest-tree cover via natural regeneration and/or planting.

The opportunities and risks posed by each forest cover scenario are those that (a) accrue once the chosen forest cover is mature, and (b) arise from the transition process to the chosen forest cover. Examples of transition opportunities include track building (for recreational use and/or value) while the land is clear, and easier control of weeds in the longer term. Examples of transition risks include weed and pest control

[24] Fisher, R. 2023. The Long View: Why We Need to Transform How the World Sees Time. Hachette UK.

costs, and the time required to achieve the desired land cover. Examples of established forest-cover outcomes include improved water quality, reduced erosion risk, fewer restrictions on access to walkways and cycleways, and contiguous ecological functioning and landscape cover beyond the boundaries of small forest stands.

In this review, we address both the forest-cover outcomes and the transition opportunities and risks.

Forest-cover scenarios

(1) *Plantation forestry with updated best management practice (mature or active transition)*

Best management practice goes further than current National Environmental Standards (NES)-Plantation Forestry and new NES-Commercial Forestry requirements, and the current management of NCC plantation forestry. They include:

- smaller harvest areas (e.g. coupe harvesting)
- ecologically beneficial riparian buffers on all waterways, including ephemeral ones
- active weed management, particularly controlling vine weeds and preventing incursion from NCC production forests to nearby indigenous forests
- animal pest control to support indigenous understory regeneration and bird populations for seed dispersal
- removal or intentional retention of non-viable or dangerous to harvest radiata pine stands
- wilding control.

The NCC Forestry Activity Management Plan 2021–2031[25] maps and describes the continued clear-felling forestry plan for NCC's production forests through to 2031. All continuing plantation forestry was proposed to be *Pinus radiata*. The PF Olsen Management Plan (2021; Table 19, p54) states that of the stands identified for retirement in the 2018 review (LandVision 2018), a total of 69.5 ha, are already retired and an additional 38.1 ha are to be retired by December 2025 (making it 107.6 ha in total). A key question we are addressing in this review is whether some or all of the remaining plantation forest (approximately 500 ha) should be retired and transitioned to permanent forest cover, and over what time period.

The current management regime involves clear-felling a stand at age 25–30 years, followed by: two herbicide treatments (we understand normally using metsulphuron and glyphosate) followed by replanting of pine at densities of 800–1000 stems/ha; then spraying again (usually aerial spray) around 2–3 years later; no pruning, and only one thinning at year 8 (PF Olsen 2021: p59–60). Prior to re-establishment, the management plan provides for a review of stand boundaries to permit, for example, widening riparian or reserve areas. However, RTRP Task Force members noted that pines replanted in 2019 above the Roding main water intake and weir were in fact very close to the river, and there was little visible riparian margin and no significant riparian planting.

Pest control, including plant and animal pests, is not currently carried out under the forestry contract. Pest weeds are not being managed in NCC's plantation forestry

[25] NCC Forestry Activity Management Plan, 2021–2031 (linked here, accessed 27 Oct 2023).

blocks. This has been identified as a matter of concern within NCC and the wider community, due to the invasion of pest weeds into adjacent indigenous forest areas (SNA) from NCC forestry blocks. Ungulate control is undertaken by NCC's Parks and Reserves Team as part of wider reserves pest work. This cost sits with Parks and Reserves and is not paid for by NCC's forestry account.

PF Olsen (2021) assessed continuous-cover forestry in which selective or small coupe harvesting is undertaken rather than clear-felling. They noted that continuous-cover forestry would deliver social and environmental benefits, but considered that it best suits multi-age forests and would have higher harvesting costs than clear-felling.

There have been three reviews of the NCC production forest estate that make recommendations on stands for retirement: Bell (2015), Catalyst (2016, reviewed 2022) and LandVision (2018). Their recommendations are referred to in the four catchment review papers and are simply summarised here.

Bell (2015) recommended continuation of an unpruned regime as this requires less upfront investment and less management input, and the felling age is less critical than for a pruned regime. PF Olsen (2015) point out that an unpruned regime suits less fertile sites such as in the Roding, whereas a pruned (clearwood) regime suits sites such as in Marsden, where growth rates are faster and branching may be excessive. Financial returns for pruned logs are likely to increase more locally than they will for unpruned, but such regimes have increased management costs.

Specific recommendations from Bell (2015) included retiring from production forestry 37 ha of the 166 ha in the Maitai, all of the 126 ha in the Brook and York Valley forest, 8.5 ha of 151 ha in the Roding, and none of the 133 ha in the Marsden. This totals 171.5 ha for retirement of a total 576-ha forest area. Bell (p14) also supported leaving or poisoning to thin radiata pine blocks that are too risky to harvest, to allow for gradual indigenous reversion. This approach is labelled 'retention forestry,' and addresses erosion mitigation as well as biodiversity enhancement (Peterson & Hayman 2018; Lambie & Marden 2020).

Catalyst (2016) recommended retiring 140 ha of a total forest area of 643 ha. The 2022 review of implementation of the 2016 recommendations did not specifically comment on progress with those recommended retirements. It did, however, identify concerns (due to wilding risk) that the Douglas fir block (Marsden 42.06) had not yet had its stand removed. The 2016 report also suggested that despite there being low risk of disruption to the NCC water intake from forestry harvests, 'a buffer zone of 100–200 m, depending upon the length and angle of the slope, should be applied to new plantings in those stands where a slope directly connected to a water supply watercourse'. For three Roding blocks (51.02, 52.02, 55.02), a buffer of 200 m was recommended.[26] Riparian protection is a matter for further action in the Roding, for example, where these guidelines were not adopted during a 2019 planting. The report also notes that the cost of felling trees that cannot be harvested safely or economically sits with the production forestry account.

LandVision (2018) produced a management plan for future land uses in the areas identified for retirement in Catalyst (2016), concluding

> *about 30.8 ha is recommended for natural regeneration of indigenous species, 55.7 ha of indigenous species revegetation, 32.8 ha of medium-term exotics (these areas are generally associated with the NCC landfill), 24.6 ha of exotic species from Douglas Fir (much of this is in the Marsden Valley), 4.6 ha of Manuka afforestation for apiculture, and 0.5 ha is proposed to leave standing.*

[26] Catalyst 2016, p44–45.

There is also a further 54.6 ha that will require further work if the current stands of radiata fail.

Ekos (2022) explores forest-carbon opportunities for NCC and recommends that NCC consider a transition forestry approach for funding the transition from large-scale clearcut forest management, via continuous-canopy or small or coupe harvest management, to permanent indigenous forest cover:

> *Exotic Transitioning to Native Reforestation Project: The model for transitioning from an exotic to native forest involves continuous cover sustainable forest management using strip or coup harvest and replacement across a 60-year management period (i.e., moving from 100% exotic to 100% native during that 60 years). This includes planting an exotic forest at the forest establishment phase and then operating a harvest/replacement regime starting in year 15 that involves removing 10% of the exotic area and replanting with natives, and repeating every 5-years until the exotic forest has reduced to zero ha.*[27]

It should be mentioned that even where a stand is not eligible for carbon credits through the New Zealand ETS (pre-1990), credits through voluntary carbon and biodiversity markets may be available and could contribute to funding the transition. Exploring this opportunity with Ekos would be useful to the planning of NCCs forestry transition.[28]

We note that in all forests, roading has been completed for previous harvests and so only maintenance costs will be needed for subsequent harvests; however, this observation also applies for access to alternative transition forest covers on the same lands.

Among the active transition options are thinning by poisoning of existing plantation stands or felling to waste. Further discussion of these approaches follows.

A report by Marlborough District Council (MDC; 2016) advocates aerial boom spraying of mature pines using a high water rate, a high rate of herbicide (metsulfuron methyl) and a good penetrant, and that these be applied when the trees are actively growing, between October and January. The application rate will be at the higher end, around 500 grams/ha at a cost of $250–$400/ha, depending on tree location and size. This method can damage existing indigenous vegetation although some waxy-leaved indigenous species such as putaputawētā, māhoe, mānuka and kānuka will survive.

For smaller blocks up to about 5 ha in size, an alternative is herbicide injection (herbicide is squirted into holes drilled into the sapwood of larger trees), or chemical ‘ring barking’ of younger saplings. This approach allows indigenous species to fare better in interspecies competition. MDC states that it should be possible to manually ground control a closed-canopy forest of radiata pine for $1,500 to $3,000/ha.

There is some evidence that the poisoning approaches can lead to groundwater contamination, with the herbicide making its way into water sources,[29] and the development of a ‘dead zone’ around trees that inhibits indigenous regeneration (Rhys Millar, pers. comm.). There is the additional consideration of risk to the public (recreational users and hunters), from falling limbs and damage to indigenous vegetation.

[27] Ekos. 2022. Forest Carbon Opportunities Report for NCC. (linked here, accessed 27 Oct 2023).
[28] Weaver, S.A. 2021. Carbon financed conservation forestry. *New Zealand Journal of Forestry* 66 (1):12–17; https://nzif.org.nz/nzif-journal/publications/article/23097, accessed 23 Oct 2023.
[29] Discussed here, https://vimeo.com/410491406, accessed 27 Oct 2023.

An alternative approach is being used in the Watercare water supply catchments in Auckland's Hunua Ranges, where 2300 ha[30] of plantation forestry are being transitioned back to permanent indigenous forest. Thinning is being achieved through chainsaw felling to waste, meaning the felled trees are left to break down and create habitat for biodiversity regeneration. A risk noted from 50 years ago at Golden Downs Forest is that thinned trees may be prone to windthrow (Eric Appleton, pers. comm.).

The thinning protocol being followed in the Hunuas began with a density of 750 stems/ha.

- Year 1: Thin to one of three densities, 350, 250 or 150 stems/ha, and compare the growth of indigenous regeneration. The results to date show that thinning to around 150–250 stems/ha has been more effective in encouraging indigenous regeneration.
- Year 5: Thin the remaining pine to 50 stems/ha, leaving some pine standing to mimic podocarp canopy with the aim of attracting seed-dispersing birds.
- The biggest factor supporting indigenous regeneration in the Hunua Ranges has been the exclusion of pest animals. Auckland Council and Watercare have undertaken very effective pest-animal control.
- Additionally, the drone dispersal of seed pods is being trialled. Anecdotal evidence is that this approach may be most effective in areas with gorse infestation, since the shrub prevents pest animals feeding on the tiny seedlings.
- A further benefit of this approach is it avoids pre-1990 land clearance penalties as it's seen as forest transition, not land clearance.

In any transition approach, subsequent wilding control can be done manually by hand pulling or sawing off small trees at ground level, either at a broad scale or by creating light wells for indigenous seedlings. This work may suit volunteer groups during winter and spring.

Deer, goats, pigs, and possums can destroy indigenous regrowth and will need to be controlled if present in high numbers. For sites with gorse or broom, spot spraying using Terbuthylazine can be used to create light wells, and indigenous species such as pittosporums, tōtara, mānuka, kānuka, māhoe and putaputawētā can survive this treatment. Gorse and broom outside the sprayed zones suppress pine re-growth. For control of species such as old man's beard, banana passionfruit and buddleia, cutting and pasting with Picloram gel products such as Vigilant is recommended.

Opportunities arising from continued plantation forestry include the existence of: the knowledge base on what works, the workforce, and supply chains for estate management and timber sale.

However, these opportunities are offset by variable and in many cases modest, negligible or negative financial yields, as reported in Paper #1. Eligibility to accrue New Zealand Emissions Units (NZU; via the ETS) on approximately 100 ha may be an opportunity, though there will also be an NZU liability upon harvest. Other 'permanent' forest cover options (including in the entire 10,000-ha estate) could accrue more returns in the medium to long term, e.g. permanent forest credits, and biodiversity credits (for indigenous forest cover and improvement).

Risks arising from the continued clear-felling of plantation forestry include:

- reduced net revenue due to increased management costs, active weed control (necessary, but not currently happening) and smaller harvest sizes

[30] https://www.waterforlife.org.nz/hunua-ranges-regeneration-project, accessed 27 Oct 2023.

- log price volatility
- environmental externalities are not incorporated into the economic decision making. For example, costs include soil loss, freshwater quality and habitat degradation, estuarine and marine sedimentation, and pest plant spread and proliferation[31]
- financial risk from damaged plantation forests (fire, windthrow)
- risk (including access) to critical infrastructure: Maitai water pipeline, Brook water treatment station, Stoke Substation in Marsden Valley, Roding weir and water intake
- high fire risk
- increasing fire, windthrow, erosion and landslide risks with climate change
- potential disease risk, and lack of biodiversity arising from a monoculture forest and harvest damage
- potential degradation of critical water supply sources (Maitai and Roding) and adjacent-high value areas (SNA)
- sedimentation of waterways, estuarine and marine environments, and impact on life and/or biodiversity within these areas
- opportunity cost of lost economic returns (unrealised potential) to the region from restricted access to the city's primary recreational reserves (estimated loss c. $20m pa[32])
- impact on community health (physical and mental well-being) through restricted access to recreational areas
- risk of loss of social licence and reputation the eyes of the community
- conflicts in some stands with other community uses and aspirations for those areas
- costs exceeding revenue in some stands, due to proximity to houses, roads or streams, and difficulty of harvest.

(2) *Alternative continuous-canopy forests of timber species for potential selective harvest*

This option includes 'continuous-cover forestry' from which timber can be selectively harvested (in 30-80 years if NCC and/or the community desire) while maintaining ecological, environmental and cultural values.

Demand for 'high end' alternative timbers in New Zealand is high, with around 78,000 m^3 of sawn timber imported in 2017, contrasting with approximately 9,000 m^3 of sawn indigenous timbers (78% silver beech, 9% rimu and 5% red beech[33]). This does not include the extensive re-use of New Zealand indigenous timbers previously milled. Alternative timbers are sought for their qualities of strength, stability, density and colour. Those qualities can be met by locally grown species, whether exotic or indigenous, if consistency of quality can be achieved (Eric Appleton, pers. comm.).

Kit Richards notes that for both harvesting and processing, there is a sweet spot between scale, productivity, cost and continuity. There is a range of viable options from

[31] Submission from Zac Milner, ecologist. (linked, accessed 27 Oct 2023).
[32] BERL (Sep 2023). Mountain biking – the economic opportunity and risk for Nelson Tasman.
[33] Kit Richards' presentation, O Tatou Ngāhere, 27 Oct 2022 (linked, accessed 27 Oct 2023).

low tech (yielding up to 5,000 m^3/year) to more intensive harvesting and processing with larger scale equipment (more than 20,000 m^3/year).

To be viable, the value of the exotic timber must be considerably greater than that of radiata pine, to cover the higher logging cost of individual trees, or small (coupe) harvesting. Eric Appleton comments[34] that the warmer slopes east of Nelson and Stoke provide an ideal opportunity to grow valuable ground-durable high-strength eucalypts, particularly with the current reducing availability from Australia (see Table 2 below). At higher altitudes prone to wind, permanent protection forest may be a better option, such as the plantings at Silvan and Kingsland forests.

Forbes (2022) suggests transitioning to a indigenous-tree, continuous-cover, forestry park across 51.4 ha of stands near the Maitai reservoir. If the Marsden forest is to be transitioned from pine, then this could also be an ideal location for a continuous-cover forestry park (indigenous and exotic), owing to the area's favourable accessibility, aspect and compatibility with other community values (recreation, amenity, reduced flood and erosion risk). Both would align with initiatives proposed in the Forestry and Wood Processing Industry Transformation Plan (2022)[35] and could position Nelson as a leader in sustainable forestry innovation.

PF Olsen's 2022 review of alternative species options for NCC's plantation forests takes a simplistic net revenue approach to their use as plantation species over a full 610 ha. The species in order of ranked theoretical returns at maturity (Table 1) are: pine ($27–33m after 25–30 years, noting that this is based on broad-scale valuations. Note that the Task Force "Value" Paper suggests much lower actual returns for NCC plantation forests and, given the low comparative value of pine, continuous-canopy management is unlikely to be profitable); redwood ($27m after 35–50 years); tōtara ($25m after 60–80 years); eucalypt peeler poles ($23m after 15–20 years), cypress such as macrocarpa ($15m after 35–50 years); Douglas fir ($13m after 30–45 years); mānuka for honey ($6m after less than 25 years); with negative returns for indigenous reversion (-$4m) and indigenous planting (-$10m). We assume the analysis does not include the costs of removal of the current land cover, i.e. the transition costs; rather, it appears each species option is costed as if established in bare land. Staging transitions would be needed in reality, to spread the costs and take advantage of revenues from current stands. The analysis also does not include the potential revenue from ETS credits (the permanent forest category) and from biodiversity credits (indigenous reforestation).

Aimers (2022) review of the PF Olsen report (2022) notes that limited attention is given to non-financial factors, and the same is true for the increased risks of climate change. Aimers suggests a landscape-based forestry options analysis is needed, as is being carried out by this Task Force. She notes that having a mix of species spreads the risks of climate change, and is desirable for environmental and economic sustainability.

ETS compliance during transition is a key factor for pre-1990 forest land. MDC (2016) summarises relevant ETS rules: pre-1990 forest land is not considered deforested if left to regenerate back into forest, or if forest species are planted, where regeneration meets the following thresholds:

- 4 years after clearing, each hectare has been replanted or has naturally regenerated with at least 500 stems/ha of forest species, or
- 10 years after clearing, predominantly exotic forest species are growing, but each hectare has tree crown cover of at least 30% from trees that have reached 5 m, or

[34] Email from Eric Appleton to Andrew Fenemor for RTRP Task Force, 3 Oct 2023.

[35] https://www.mpi.govt.nz/forestry/forest-industry-and-workforce/forestry-and-wood-processing-industry-transformation-plan/, accessed 27 Oct 2023.

- 20 years after clearing, predominantly indigenous forest species are growing, but each hectare has tree crown cover of at least 30% from trees that have reached 5 m.

In Nelson, these requirements should be able to be met because of the rapid regeneration of pines and indigenous species here. However, removal of wildings and vine weeds needs consideration as does management of browsing animals such as deer, goats and possums. Old man's beard and banana passionfruit are the most likely species to suppress indigenous forest species in an existing pine block if allowed to form a mat of vines. A thick cover of gorse or broom can be considered as acceptable for ETS purposes, where they are acting as a nursery crop for indigenous species. MDC (2016) notes options to maintain ETS compliance include a Tree Weed Exemption, which can be obtained from the Ministry for Primary Industries (MPI) that would allow wilding pine control to be undertaken without liability, or undertaking some indigenous planting, which has the added advantage, if local podocarp species such as rimu, tōtara and kahikatea are planted, of speeding up the slow process of indigenous forest succession. Rhys Millar (pers. comm.) affirmed that, because the intention was to transition from one type of forest to another, deforestation penalties are unlikely to apply.

Given the climate suitability of east Nelson for many exotic timber species (Eric Appleton, pers. comm.), there appears to be an opportunity for NCC, along with other motivated Te Tau Ihu landowners, to trial some stands of alternative exotic species and in the longer term support development of processing to replace some of the sawn-timber imports. Such a vision could be built on linkages with timber users such as the Centre for Fine Woodworking and local furniture makers. It is consistent with the renaissance of interest in woodlands for multiple local uses occurring across northern hemisphere countries (Ennos 2020). It is also consistent with the vision of Forest Growers Research to develop an industry body for New Zealand's specialty timbers industry.[36]

Appleton's Tree Nursery (Eric Appleton, pers. comm.) has provided suggestions for suitable species (Table 2).

Table 2: Exotic amenity and timber species suitable for eastern Nelson

Broadleaf trees fire suppression species	
Moist valley floor	
Acer rubrum (Red maple)	Autumn-coloured deciduous trees, to group or scatter, also tolerates dry sites
Acer saccharinum (Silver maple)	Autumn-coloured deciduous trees, to group or scatter
Platanus (Plane tree species)	A riparian species in its native country, Turkey

[36] Forest Growers Research. 2020. A proposal to develop New Zealand's alternative timbers industry, https://fgr.nz/documents/download/8365?2139458104, accessed 27 Oct 2023.

Populus species (poplar) and New Zealand-bred hybrids	Widely used for soil conservation plantings, of good form and vigour and due to be more widely tested for timber properties. Prune to produce peeler and sawlog quality. Could have a place in narrower gullies to prevent gravel and silt movement, and to divide large pine blocks if smaller logging coupes are wanted. This genus is extensively utilised in the northern hemisphere.
Quercus palustris (Pin oak)	Tolerates wet places, though may not be a stable timber option
Liriodendron tulipifera (Tulip tree)	Autumn-coloured deciduous trees, to group or scatter
Liquidambar styraciflua (Liquidamber)	Autumn-coloured deciduous trees, to group or scatter
Dry hillside	
Quercus petraea x robur (Hybrid English oak)	From early Canterbury hybrids
Quercus ellipsoidalis (Northern pin oak)	Grows straight in the open, red-autumn colour. Autumn coloured-deciduous trees, to group or scatter, tolerates dry sites
Quercus species	A range of Mexican evergreen oaks (straight; have done well in dry Marlborough settings; promising for timber; plug-grown), including *affinis*, *crispipilis*, *crassifolia*, *laurina* and *rysophylla*). They would blend well with indigenous regeneration, are adapted to periods of drought, some growing with pine species at altitude.
Acer saccharrum (sugar maple)	Autumn-coloured deciduous trees, to group or scatter, tolerates dry sites
Suggested timber alternatives to *Pinus radiata*	
Sequoia sempervirens (Californian redwood)	Withstands fire, has deep roots, needs a temporary interplant like kānuka, alder or cypress; don't thin as they regrow; planting new land requires another conifer to provide mycorrhiza. Plant at final crop spacing and interplant with a slower growing companion to shade the trunks of the redwoods during pruning to avoid epicormic shoots. *Pittosporum tenuifolium* and *P. eugenioides* could be used and are not inflammable like kānuka. Rotation age 45 years, much longer if required, amassing a large volume of high-quality

	timber in great demand in California and Asia. Redwoods can recover from fire even if all the branches are burnt off; they resprout from under the thick bark. Their ability to coppice from the felled stump will mean they are there for the long term.
Cryptomeria japonica (Japanese cedar)	Ross Higgins had nice examples at Pigeon Valley on a shady slope. In Hira, it held up when others blew over.
Cupressus lusitanica (Mexican cypress)	Has no canker, unlike macrocarpa
Cupressocyparis ovensii (Ovens cypress	New hybrids from Scion; provide heavy shade despite pruning
Cupressus torulosa (Himalayan cypress)	Good on hot dry slopes, Robert Appleton has some in Pig Valley; one was removed from Isel Park
Cedrus atlantica (Atlas cedar)	Not for flats; see it in Marsden cemetery's small dog exercise area where it was planted 60 years ago. *C. lusitanica* failed there
Cedrus deodara (Himalayan cedar)	
Pinus canariensis (Canary Island pine)	Withstands fire
Eucalypts (these are site specific and suit the milder climate of east Nelson)	
Eucalyptus cladocalyx (Sugar gum)	Class 1 (highest) ground durability, and the most wind tolerant of the durable eucalypts
Eucalyptus microcorys (Tallowwood)	
Eucalyptus globoidea (White stringybark)	Class 2 ground durable
Eucalyptus muelleriana (Yellow stringybark)	Class 2 ground durable.

Eucalyptus pilularis (Blackbutt)	
Corymbia maculate (Spotted gum)	Class 2 ground durable (see mature one next to the chapel at Wakapuaka Cemetery)
Eucalyptus fastigata (Brown barrel)	Class 3 ground durable (outstanding examples at old Golden Downs HQ growing on the valley bottom with a considerable volume of prime sawlogs and a light understorey of indigenous shrubs). Frost hardy to -10ºC, and with a good sawing and seasoning reputation for flooring, internal panelling and strong construction. They do not shed bark and show good fire resistance, with vigorous epicormic growth following fire.
(larch)	Jacky Friedmann (Appleton's nursery manager) mentioned these for autumn colour

Eric Appleton notes that *Pinus radiata* is better suited to hillsides such as in the Roding, as it suffers from Dothistroma and red needle blight in valley bottoms where alternative higher value species would be more suitable.[37] In contrast, Forbes (2022) advised, 'Roding Forest has attributes and is set in a context which is favourable to passive [native] regeneration with supporting plant and animal pest control.'

Opportunities arising from alternative indigenous, continuous-cover timber species include: NCC providing a proving ground for approaches to forestry transition, and alternative timbers locally; the amenity, land-stability and water-quality benefits provided by restoring continuous-canopy forests; the suitability of the existing mix of small stands for planting diverse assemblages of selectively harvestable species; improved community well-being outcomes through access to recreational opportunities and connection with nature; significant regional economic benefit through improved planning for recreational users (tracks etc.), and recreational tourism growth; the potential for multiple revenue streams (timber, tourism, honey, ETS credits, biodiversity credits).

Specific risks arising from alternative continuous-cover timber species include the time and cost of establishment, and potential community concerns about the use of some exotics instead of 100% indigenous to replace pine.

Comparative risks when considered alongside continuing the clear-felling of pine include:

- longer time to achieve timber revenue, and uncertainty about production and yields, but there are opportunities for co-benefits, e.g. a tōtara plantation can be economically viable and provide environmental benefits
- timber revenue from pine is realised only upon mature harvest of a stand, whereas a diverse-species continuous-canopy approach could provide annual revenue sources that may outperform pine timber harvest returns over a similar time frame. Sources of revenue, if desired by NCC and the community, to support the implementation of the transition could include external and grant

[37] Email from Eric Appleton to Andrew Fenemor for RTRP Task Force, 3 Oct 2023.

co-funding, honey production leases, and recreation, carbon and biodiversity credits

- lower financial risk from damaged forests (fire, windthrow)
- less risk to critical infrastructure, once tree cover is established
- potential similar fire risk during the transition phase owing to longer scrub cover prior to canopy closure
- lower longer term fire, windthrow and erosion risks with climate change owing to the absence of clear-felling
- some disease risk but it is manageable (e.g. canker in macrocarpa); improved biodiversity from a diverse cover
- reduced risk to critical water supply sources (Maitai and Roding) and adjacent high-value areas (SNA) owing to the absence of clear-felling
- reduced sedimentation of waterways, estuarine and marine environments, and reduced impact on life and biodiversity in these areas
- fewer closures of the city's primary recreational reserves, though fire risk and localised harvest would not prevent closures entirely
- improved social licence in the eyes of the community, provided the transition was affordably staged
- reduced conflicts with other community uses and aspirations for those areas.

(3) *Mixed indigenous and exotic amenity forest-tree cover*

This option includes stands with parts with existing pine, which will either cost more to harvest than they will return, or are too dangerous or inaccessible to harvest. Such areas could be poisoned or felled to encourage indigenous regeneration (Bell 2015; MDC 2016); or be left in perpetuity, if there is community support for this and the risks didn't outweigh the benefits.

MPI (2023) notes that the potential of other canopy species (e.g. angiosperms such as species of *Eucalyptus* and *Acacia*), especially when planted in polycultures, needs further examination. Increasing litter and humus layers are known to make plantations more conducive to native plant colonisation over time, although deep and/or dry litter layers, or highly competitive shallow root zones, can also limit seedling regeneration. Either uniform thinning or lower stocking, or creation of overly larger gaps, can promote the establishment of undesirable light-demanding (often exotic) species, creating small gaps gradually and repeatedly across a plantation is a better strategy as the forest microclimate is preserved. It may not, however, be possible for some native species to establish into an exotic plantation, such as those requiring large-scale disturbance for establishment (e.g. red beech).

Polycultures of exotic tree species could encourage structural diversity (e.g. subdominant trees), thereby providing greater biological diversity and better indigenous regeneration. Two functional benefits of establishing exotic and indigenous canopy together are: (1) transitional forests provide differing types of resources (e.g. feeding guilds), with differing timing (e.g. continuous supply of nectar or fruit) to support dispersers, and (2) that forest structure development provides suitable bird perches for seed deposition (MPI 2023).

The pros and cons of this option are similar to those discussed above, without the potential for selective harvest revenue (in 30–80 years). That factor would remove the need to consider harvest access and roading when planning the planting of exotic or indigenous mixes.

Opportunities arising from mixed indigenous and exotic forest are similar to those seen at Silvan Forest and also are being implemented for Tasman District Council's (TDC's) Kingsland Forest. They include a designed landscape with diversity of species, water-quality and biodiversity benefits of permanent canopy forest, and compatibility with other land uses such as recreation.

Risks arising from mixed indigenous and exotic forest again include the time and cost of establishment, and potential community debate about using some exotics instead of 100% indigenous species to replace pine. There may be increased health and safety risks in regard to community and recreational access into areas with poisoned trees, which could be managed with felling. Catalyst (2022) suggests that pine stands that are not economically viable to harvest should be felled and/or removed at the cost of the forestry account.

Comparative risks when considered alongside continuing clearfell pine include:

- timber revenue from pine is realised only upon mature harvest of a stand, whereas a diverse-species continuous-canopy approach could provide annual revenue sources that may outperform pine timber harvest returns over a similar time frame. Sources of revenue, if desired by NCC and the community, to support the implementation of the transition could include external and grant co-funding, honey production leases, and recreation, carbon and biodiversity credits
- lower financial risk from damaged forests (fire, windthrow)
- less risk to critical infrastructure, once tree cover is established
- potential similar fire risk during the transition phase owing to longer scrub cover prior to canopy closure
- lower longer-term fire, windthrow and erosion risks with climate change owing to the absence of clear-felling
- improved biodiversity from a diverse land cover
- reduced risk to critical water supply sources (Maitai and Roding) and adjacent high-value areas (SNA) owing to the absence of clear-felling
- reduced risk of landslides impacting housing
- reduced sedimentation of waterways, estuarine and marine environments, and reduced impact on life and biodiversity within these areas
- fewer closures of the city's primary recreational reserves, though fire risk and localised harvest would not prevent closures entirely
- improved social licence in the eyes of the community, provided the transition was affordably staged
- reduced conflicts with other community uses and aspirations for those areas.

(4) *Indigenous forest tree cover via natural regeneration and/or planting*

The indigenous forest option should reflect consideration of what the original indigenous forest cover was. The SNA089 Ecological Significance report[38] describes the natural indigenous forest cover of the NCC forests as: mixed broadleaved forest associations in incised mid–lower gully bottoms; māhoe-kāmahi forest in upper gully bottoms; mixed beech–podocarp-broadleaved forest on alluvium (Maitai and Roding rivers); black beech forest on alluvium (Brook catchment); hard beech (+-kāmahi) forest on side-slopes and spurs; mixed broadleaved limestone forest on spur side-

[38] M North, 2008 SNA089 Ecological Significance Report (linked here; accessed 27 Oct 2023).

slope and ridge; mixed beech–podocarp–broadleaved forest on limestone side-slopes; red beech +-silver beech forest on upper side-slopes and upper spurs; podocarp–black beech forest on side-slopes; kānuka (+-broadleaved) forest on side-slopes and ridges; Patuki Melange bog forest – cedar, pink pine, beech. The Marsden Valley Reserve Ecological Restoration Plan[39] is an excellent example of the kind of analysis and approach that could be adopted and implemented across the transition areas.

Forbes (2022) describes regeneration options as either 'passive', involving mainly animal and plant pest control, or 'assisted regeneration', in which low-density indigenous tree plantings are added to speed up canopy cover. A third approach, 'forest restoration planting', uses high densities of planted seedlings to achieve canopy closure within 3–5 years. There is active debate whether lower densities can also be successful and more cost effective (Robert Appleton, pers. comm.), with current planting densities ranging from 4500–5000 stems/ha, as seen in the Task Force field visit, down to 1100 stems/ha (3x3m spacing) at Silvan Forest.

Forbes et al. (2023) summarise in Figure 2 (see below) the factors affecting decisions about active or passive regeneration. They note that adequate forest management is essential to achieve high levels of indigenous forest health, functionality and permanence. Primary factors to be considered are mean annual rainfall, mean annual air temperature, proximity and composition of adjacent seed sources, landform type, slope aspect, slope, topographic exposure, and the presence of existing woody cover. Eric Appleton notes[40] that natural regeneration may result in one or two species of pioneer shrubs establishing in a mass, with woody weed species dense in other parts and the result may be less than satisfactory. With an active spread of 1100 chosen species across the area, the volunteer indigenous regeneration can bulk it up and aid the suppression of the woody weeds. With the original planting in lines, release cutting can be more effective. He suggests using exotic nurse crops such as the N-fixing *Alnus cremastogyne* or *A. glutinosa* form 'imperialis', which could later be poisoned or would be outcompeted by resurgent bush.

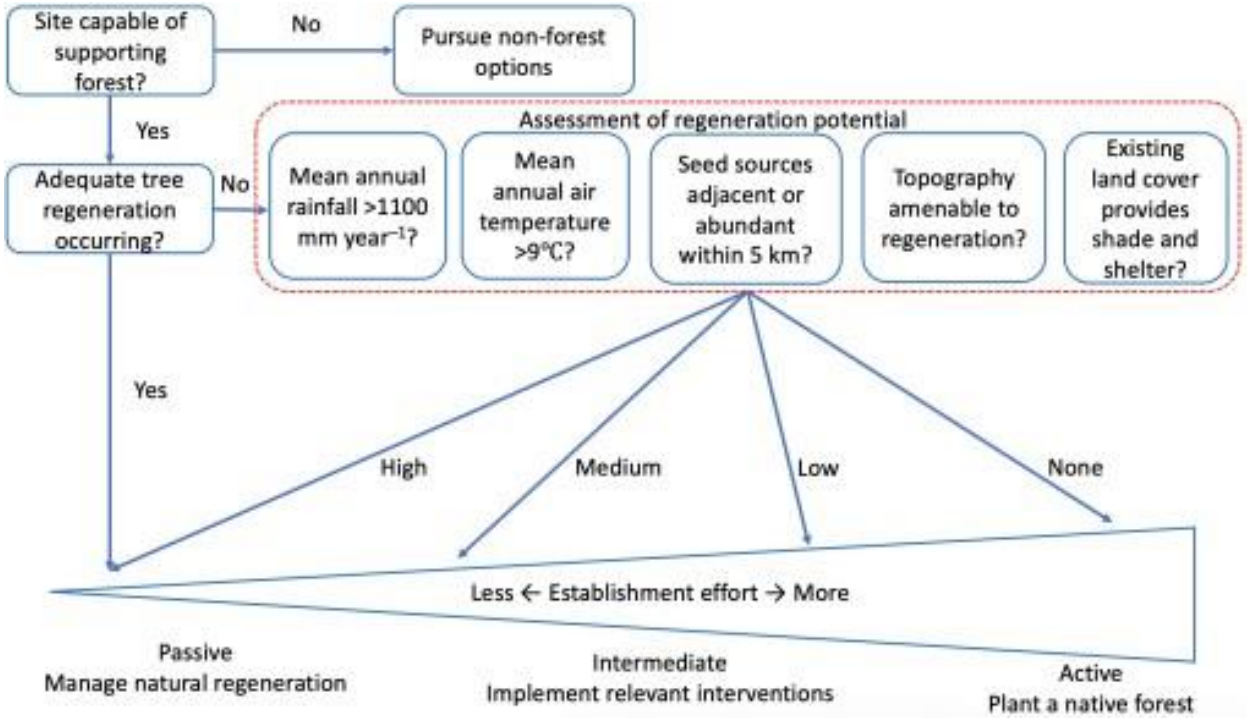


Figure 2: A stepped approach for determining active or passive restoration mode at the site scale (Forbes et al. 2023).

[39] Kaitiaki O Ngāhere. 2021. Marsden Valley Reserve Ecological Restoration Plan, 2021–2030.
[40] Email from Eric Appleton to Andrew Fenemor for RTRP Task Force, 3 Oct 2023.

Meg Graeme (pers. comm.) posits planting pines at low stocking rates as a nurse crop to support and speed up indigenous forest establishment where natural revegetation is hindered by factors such as erosion risk or effects of climate change (e.g. drought). Management priorities would be to enhance carbon absorption and land stabilisation. MPI (2023) suggest that indigenous biomass would exceed pine biomass in 100–150 years after establishment but that methods such as planting of secondary tall forest species (i.e. enrichment planting) could speed this up to 50 years or so. This would be contingent on there being extensive control to ensure successional wilding pines were not allowed to out-compete indigenous species. The Task Force notes there may be less community support for this approach.

Contrasting this approach is consideration of limited financial resources NCC may have for funding the transition, and that any expenditure to achieve indigenous reforestation would be best directed towards weed and pest exclusion (Brad Chandler, pers. comm.).

Tāne's Tree Trust does not support the use of new pine plantings as a nurse crop (Meg Graeme, pers. comm.). The Trust supports the use of indigenous pioneer plants to initiate indigenous forest establishment, and are supportive of using existing pine to transition to permanent indigenous forest in certain areas (e.g. in harsh places like dunelands – see their Coastal Buffers guidelines[41]) and on steeplands, where management priorities are to provide suitable conditions for the establishment of indigenous shrub and tree seedling. An example where this latter approach could be implemented would be in the Roding, where young pine (replanted 2018 and 2019) could be selectively thinned to allow indigenous regeneration.

North and Atkinson state,

> *Older stands of gorse can support native regeneration without replanting by acting as shelter and by excluding browsing animals. If you have a nurse crop such as gorse, you can let natural regeneration take its course, provided there are seed sources nearby. Such a process can be speeded up by creating light-wells around existing native seedlings or with supplementary plantings, as gorse can dominate an area for some time, particularly in dry areas.* [42]

Hinewai Reserve is an excellent example of this, where indigenous forest was successfully restored over 30 years, with gorse as the primary nurse crop. "...it is an ecologically well-known fact that gorse is a pioneer succession plant and it will give way, under most circumstances, to native forest." The key was to leave it well alone, take away the things that stopped the regeneration process and let nature do the hard work, Dr Hugh Wilson says.[43]

In a specific report for NCC, Forbes (2022) describes 'transitional forestry' using approaches such as canopy gap creation and enrichment planting; he recommends this for eight small stands in the Brook using an adaptive approach. Forbes has recommended passive regeneration in the Roding, parts of the Brook and the Maitai where indigenous forest lies adjacent. In remaining areas, Forbes proposes assisted regeneration. Forbes states,

> *Marsden forest presents another opportunity to extend native tree cover north towards Nelson city, thereby boosting the city's biodiversity values. The forest, if*

[41] https://www.tanestrees.org.nz/projects/adaptive-management-of-coastal-forestry-buffers/, accessed 27 Oct 2023.
[42] https://www.tasman.govt.nz/document/serve/Go%20Wild%20Native%20Restoration%20Manual.pdf?DocID=26551, accessed 27 Oct 2023.
[43] https://www.rnz.co.nz/national/programmes/ninetonoon/audio/2018703481/gorse-for-the-trees-how-one-man-brought-back-a-forest, accessed 27 Oct 2023.

converted to native cover, could form an approximate 180 ha extension to SNA 89.

He also notes that for Marsden, plantation forestry could be considered as an option to assist in funding the transition of other areas.

Key factors influencing the suitability of an area for indigenous regeneration versus the planting of indigenous species include proximity to seed sources (they should be no more than 100 m away), likelihood of invasive and wilding species limiting regeneration and the speed within which regeneration is wanted. The latter point affects risks such as fire and land instability.

MDC (2016) provides guidelines for regenerating pines to indigenous cover in the Marlborough Sounds, so has some relevance to eastern Nelson. The authors observe that indigenous regeneration can be vigorous, especially on shady and moist, south-facing slopes. But regrowth is slower and less dense on northern faces with weeds and wildings, broom, gorse and old man's beard quickly become dominant once pines are removed. Where there is no management intervention after harvesting, pine seedlings will generally regenerate vigorously and dominate a site.

The Our Land and Water National Science Challenge is promoting the Tīmata Method[44] in which kānuka and mānuka are planted at lower densities, acting as a nursery crop for succession trees to establish in the future. The method relies on careful land preparation, the use of easily propagated indigenous nursery crop species, cultivation of plants in small-size containers known as forestry-grade, and fewer trees per hectare than according to conventional guidelines.

For NCC, the success of indigenous replanting in clear-felled areas can be seen in the Codgers area of Brook forest; Forbes (2022) describes 1.5 m growth of planted kānuka and good growth of tōtara between 2020 and 2022. It has been noted at Silvan Forest (Matt Griffin, pers. comm.) that the absence of dry summers since 2018 has limited losses of plantings and boosted growth rates, so summer drought risk is a consideration when implementing any plantings, along with browse by goats, deer, pigs, and possums and invasive plant overgrowth, especially by vines like old man's beard. Gorse is better managed by planting species, which can outcompete and ultimately shade it out, (Robert Appleton, pers. comm.) as it is a nurse crop and fixes nitrogen, thereby improving soil fertility.

Among existing indigenous transition efforts is a 4000-ha project at Maungataniwha in Hawkes Bay that involved leaving the land 3 years without management, and then spraying wilding conifers with herbicide (metsulfuron) except in areas where indigenous species predominate (MDC 2016). Wilding control by aerial spraying as at 2019 was costing $292/ha (Lambie & Marden 2020). Interestingly, the Maungataniwha project has sponsorship from a Hamilton food production company establishing plantation mānuka for mānuka honey production. Lambie and Marden (2020) note that plantation mānuka should act as a nursery crop for broadleaf–podocarp secondary forest if wilding pines that emerge in the plantation mānuka are removed and the risk of fire is reduced. Mānuka is highly flammable, but the fire risk can be mitigated by the implementation of 'green firebreaks' using other indigenous species with low flammability, including karamū, karaka, kohekohe, five-finger, hangehange and kōtukutuku.

A 1100-ha project at Waingake near Gisborne showed impressive regeneration of indigenous woody trees under a passive regeneration regime, although goat and wilding pine control are required (Forbes 2021a).

[44] The Tīmata Method for Low-Cost Native Forest – Our Land & Water – Toitū te Whenua, Toiora te Wai (ourlandandwater.nz, accessed 27 Oct 2023).

In a case study at Whataroa Bay near Port Underwood, Forbes (2021a) notes that past indigenous recolonisation has taken about 40 years so far, that management of wilding pines, goats and possums is critical, and that allowing gorse to act as a nurse crop, potentially with enrichment planting, is desirable. Similar interventions are recommended at Cable Bay Adventure Park, north Nelson, with the additional threat from old man's beard needing control.

A third case study is on Ngāti Koata land adjacent to NCC's Maitai forests that had been cleared in 2013–14 with subsequent wilding regeneration and limited seed sources for passive regeneration. Here, Forbes recommends pest control along with passive indigenous reforestation on southern slopes but herbicide spraying of weed-infested northern slopes, with grassing then the planting of indigenous species such as mānuka, tōtara, horoeka and tītoki. A multi-use plantation for whakairo (carving) and firewood is also proposed. This case study shows how a contiguous approach with Ngāti Koata to NCC's transition options would be beneficial.

In a final case study at Ligar Bay, on Separation Point Granite terrain, wilding pines are being controlled alongside enrichment planting of tōtara, kahikatea, rimu, beech and rata, with gorse regenerating also. Indigenous regeneration is strongest on the south-facing slopes, but control of browsing animals is a challenge.

Opportunities arising from indigenous tree cover include many of the ecosystem services previously outlined under the above sections on continuous-canopy and mixed indigenous and exotic reforestation, such as: environmental benefits, less sediment movement into waterways, less impact on landscape character, improved biodiversity, contribution to ecological corridors, less risk to urban water supply, better recreational opportunities, and protection of archaeological sites. Additional benefits of this approach include: ongoing ETS revenue from permanent forests category, ongoing biodiversity credits revenue (only available under this option) - both would help fund ongoing management, community support for the maximising of values described above, lower transition costs with passive regeneration (primarily involves weed and pest control), indigenous reforestation funding opportunities (grant and external investment), and community involvement in planting and management.

Risks arising from indigenous tree cover, and its longer transition period, include: an attendant longer period of transition costs and exposure to risks of fire and erosion, plant establishment failure in drier summer conditions such as El Nino weather, variable establishment rates if relying on natural regeneration processes or seed-island plantings, and cost and sources of revenue for establishment, although external and grant funding opportunities for indigenous reforestation may be greater.

Comparative risks when considered alongside the continuing clear-felling of pine are the same as for option 3 above and include:

- timber revenue from pine is realised only upon mature harvest of a stand, whereas a diverse-species continuous-canopy approach could provide annual revenue sources that may outperform pine timber harvest returns over a similar time frame. Sources of revenue, if desired by NCC and the community, to support the implementation of the transition could include external and grant co-funding, honey production leases, and recreation, carbon and biodiversity credits
- lower financial risk from damaged forests (fire, windthrow)
- less risk to critical infrastructure, once tree cover is established
- potential similar fire risk during the transition phase owing to longer scrub cover prior to canopy closure
- lower longer-term fire, windthrow and erosion risks with climate change owing to the absence of clear-felling

- improved biodiversity from a diverse land cover
- reduced risk to critical water supply sources (Maitai and Roding) and adjacent high-value areas (SNA) owing to the absence of clear-felling
- reduced risk of landslides impacting housing
- reduced sedimentation of waterways, estuarine and marine environments, and reduced impact on life and biodiversity within these areas
- fewer closures of the city's primary recreational reserves, though fire risk and localised harvest would not prevent closures entirely
- improved social licence in the eyes of the community, provided the transition was affordably staged
- reduced conflicts with other community uses and aspirations for those areas.

Transition costs assessed

Costs for transition will vary considerably, depending on approach (e.g. passive regeneration versus active planting versus pine-thinning forestry transition), species selection, planting densities and staging of the transition. For example, the planting of 75 ha of cleared pine forest at Silvan Forest behind Richmond has cost around $12,000/ha, with ongoing maintenance costs (c. $500/ha/year) associated with clearing vines and wilding pines from the seedlings to ensure successful establishment costing about $500/ha per year (Matt Griffin, pers. comm.). At present, indigenous seedlings are costing around $3 each and exotics $2.05–$4.60 each excluding GST (George Daly at TDC's Kingsland Forest, pers. comm.).

Forbes et al. (2023) note that the average cost for high-density indigenous tree planting in New Zealand was estimated in 2021 to be $23,000/ha; the costs for passive and assisted regeneration are less (but highly variable), at $595–$15,000/ha (Forbes 2021b), depending on the approach and planting density.

For NCC's forestry transition, Forbes' (2022) recommendations for indigenous forest establishment estimates the costs to range from $2,550/ha for passive regeneration up to c.$30,000/ha for forest restoration planting. Ongoing maintenance costs are estimated to be $525/ha/annum. Assuming the entire production forest estate (c. 600 ha) were to begin transition in year 1, this would mean a total cost in the first 5 years of $4.5m ($900,000/year) then $315,000/year thereafter ($525/ha/year). Refer to Forbes' table 1 below (Forbes 2022).

However, we note that in reality, these costs would be spread out over a much longer period owing to the varying age of our production forest stands. The Wildlands (2022) review of Forbes' costings suggests that costs could be reduced if techniques such as a more gradual transition from pines to indigenous species are considered, a process of research-by-management in which, for example, the indigenous seedlings remaining after pine harvest are not sprayed off, or lower-intensity harvest methods are employed (which support speedier regeneration).

Table 1. Summary of cost estimates for native forest establishment via a combination of approaches across Maitai, Brook and Roding Forests over the first 5 years and ongoing.

	First 5 years									Ongoing (beyond first 5 years)							
Forest and forestry method	Area	Animal pest control	Fencing	Plant pest control	Planting	Wilding conifer control	Cost/ha	Cost/ha yrs 1-5	yrs 1-5 cost total area	Area	Animal pest control	Fencing	Plant pest control	Planting	Wilding conifer control	Cost/ha/annum	Cost/annum/area
	ha	$/ha	$	$/ha	$/ha	$/ha	$/ha	$/ha	$/area	ha	$/ha	$	$/ha	$/ha	$/ha	$/ha/yr	$/yr/area
Maitai Forest																	
Passive regeneration	26.3	50	0	0	0	2 500	2 550	2 750	72 270	26.3	25	0	500	0	0	525	13 797
Assisted regeneration	158.4	50	0	0	9 304	2 500	11 854	12 054	1 909 354	158.4	25	0	500	0	0	525	83 160
Continuous-cover forestry	51.4	50	0	500	11 199	0	11 749	13 949	716 964	51.4	25	0	500	0	0	525	26 985
Brook Forest																	
Passive regeneration	92.8	50	0	0	0	2 500	2 550	2 750	255 200	92.8	25	0	500	0	0	525	48 720
Assisted regeneration	36.5	50	0	0	9 304	2 500	11 854	12 054	439 971	36.5	25	0	500	0	0	525	19 163
Forest restoration planting	2.4	50	0	0	27 425	2 500	29 975	30 175	71 213	2.4	25	0	500	0	0	525	1 239
Transitional forestry	22.1	50	0	1 000	8 681	0	9 731	13 931	307 463	22.1	25	0	500	0	0	525	11 587
Roding Forest																	
Passive regeneration	261.4	50	0	0	0	2 500	2 550	2 750	718 740	261.4	25	0	500	0	0	525	137 214

The following tables (Wildlands 2022) give an indication of the per hectare costs for the transition approaches recommended by Forbes (2022) for the Brook, Maitai and Roding production forest blocks over a 10-year period. It is important to note that, given the variation in age and stage of forestry stands being transitioned, many of the costs will not begin in year 1. For example, a stand with 15-year-old pines in 2023, to be grown to economic maturity (which takes 12 years) and then harvested, will have transition costs beginning in year 12 (though advance planning, 2–3 years prior, is critical for maximising transition opportunities, such as track building, and improving planting outcomes). On the other hand, if a transitional forestry approach is taken, then thinning may begin at any time, noting that the sooner transition begins in a stand, the sooner the desired transition reforestation outcomes will be realised.

MAITAI FOREST

			Area	Unit Cost	Per Hectare Cost	Operations	Operation Subtotal Per Hectare	Subtotal Annual Cost	Years 1-5 Cost	Years 6-10 Cost	Total 10 Year Cost	Annual Cost Per Ha
Passive Regeneration			**26.3**									
Years 1-5	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		72,325			
Years 6-10	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	13,807.5		69,037.5	141,362.5	537.5
Assisted Regeneration			**158.4**									
Years 1-5	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		435,600			
Years 6-10	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	83,160		415,800	851,400	537.5
	Plant cost			2.69	4,304							
	Stems per ha			1,600								
	Planting cost				5,000		9,304			1,473,753.6	1,473,753.6	
Silvicultural Park			**51.4**									
	Pest animal control	Follow-up			50	5	250					
	Wilding conifer control	Follow-up			500	5	2,500	28,270	141,350		141,350	275
	Plant cost			3.84	3,198.72							
	Stems per ha			833								
	Planting cost				8,000		11,198.72				575,614.21	
	Total area		**236.1**						**Total cost**		**3,183,480**	
	Stand area (Table 16 in PF Olsen Management Plan)		**160**						**Annual cost per hectare**			**1,348.36**
									Total cost per hectare			**13,483.61**

RODING FOREST

			Area	Unit Cost	Per Hectare Cost	Operations	Operation Subtotal Per Hectare	Subtotal Annual Cost	Years 1-5 Cost	Years 6-10 Cost	Total 10 Year Cost	Annual Cost Per Ha
Passive Regeneration			**261.4**									
Years 1-5	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		718,850			
Years 6-10	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	137,235		686,175	1,405,025	537.5
	Total area		**261.4**						**Total cost**		**1,405,025**	
	Stand area (Table 16 in PF Olsen management plan)		**228.5**						**Annual cost per hectare**			**537.50**
									Total cost per hectare			**5,375.00**

BROOK FOREST

			Area	Unit Cost	Per Hectare Cost	Operations	Operation Subtotal Per Hectare	Subtotal Annual Cost	Years 1-5 Cost	Years 6-10 Cost	Total 10 Year Cost	Annual Cost Per Ha
Passive Regeneration			**92.8**									
Years 1-5	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		255,200			
Years 6-10	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	48,720		243,600	498,800	537.5
Assisted Regeneration			**36.5**									
Years 1-5	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		100,375			
Years 6-10	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	19,162.5		95,812.5	196,187.5	537.5
	Plant cost			2.69	4,304							
	Stems per ha			1,600								
	Planting cost				5,000		9,304				339,596	
Forest Restoration Planting			**2.36**									
	Pest animal control	Initial			50	5	250					
	Wilding conifer control	Initial			2,000	1	2,000					
	Wilding conifer control	Follow-up			500	1	500		6,490			
	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	1,239		6,195	12,685	537.5
	Plant cost			2.69	4,304							
	Stems per ha			1,600								
	Planting cost				5,000		9,304				21,957.44	
Transitional Forestry			**22.1**									
	Pest animal control	Initial			50	5	250					
	Pest plant control	Initial			1,000	5	5,000	23,205	116,025			
	Pest animal control	Follow-up			25	5	125					
	Wilding conifer control	Follow-up			500	5	2,500	11,602.5		58,012.5	174,037.5	
	Plant cost			2.69	1,614							
	Stems per ha			600								
	Planting cost				5,000		6,614				146,169.4	
	felling or basal poisoning				2,000	1	2,000		44,200		44,200	
	Total area		**153.76**						**Total cost**		**1,433,632**	
	Stand area (Table 16 in PF Olsen management plan)		**113**						**Annual cost per hectare**			**932.38**
									Total cost per hectare			**9,323.83**

A submission from the Nelson Tasman Climate Forum[45] in support of creating "a contiguous native cover from the Maitai to the Roding and beyond" estimated the costs to convert 650 ha to permanent indigenous forest as $28m to revegetate (based on the actual costs for replanting a similar area in Tasman), assuming: 2500 plants/ha at $17.50 per plant. ($17.50 includes plant, stakes, guard, planting preparation, planting, maintenance and project management, but NOT pest animal control or infrastructure). It suggested the costs could be spread over 10 years. These cost estimates equate to $43,000/ha. The submission outlined approaches that could help reduce costs, and also noted the avoided and hidden costs of continued pine plantation. The Task Force notes the entire transition of the forestry estate from clear-felling harvest to alternative reforestation in year 1 won't happen given the varying age of the stands; thus, with a gradual transition and a variety of less costly approaches, costs will be reduced and spread across a longer timeframe.

In summary, transition costs are highly dependent on the scenario chosen and on factors such as pest and weed infestation, and the desired timing to achieve canopy cover. Costs in the range $2,500/ha to $10,000/ha for passive or assisted regeneration and transition forestry have been reported. While $10,000–$40,000/ha for planting

[45] View submission, https://drive.google.com/file/d/1c0qN4ceDG_pqdlLrrcJzlM_dUot_dd37/view?usp=sharing, accessed 27 Oct 2023.

establishment have been referenced, planting at lower densities (say 1100 stems/ha such as at Silvan Forest) at $12,000/ha is a more cost-effective approach.

Part 3: Conclusions and recommendations

This section draws together observations from the literature review and the input from interested parties that is relevant to transitions on NCC's lands.

Key transition challenges

A clear strategic vision is critical. Silvan Forest's 200-year vision, and the mapping and modelling of the desired forest outcome, are impressive, and the Task Force recommends NCC takes a similar approach, using techniques developed and employed in the Silvan Forest transition, such as the GIS mapping and modelling undertaken by Luke Porter (Boffa Miskell).

We agree that the clear-felling of pine in highly used recreational areas is disruptive of community and visitor use, and a visual eyesore at harvest and for about 10 years afterwards, so those areas (which include mountain biking, walking and paragliding areas) should be priorities for active transition.

Priority areas for transition include: currently cleared stands in the Maitai, Brook, Marsden and Roding catchments, any stand likely to return a marginal (less than 5%) or negative ROI over a harvest cycle, stands forming a visible backdrop to the city in the Maitai, Brook and Marsden catchments, and those stands likely to achieve identifiable freshwater, biodiversity or recreational value improvements.

All the transition options (i.e. 1–4) have notable risks, both during the transition process and, although less severe, at canopy closure (or equivalent), including seedling failure, browsing by animal pests and competition from pest plants, prolonged period of higher fire risk, and establishment costs. Ongoing clear-felling forestry has its own risks, especially on- and off-site environmental impacts, less resilience due to climate change and greater loss of social licence.

The Task Force's first and most important challenge has been to generally assess what land can be planted for commercially productive timber purposes (scenarios 1 and 2 above) and what land should be regarded as protection forest (scenarios 3 and 4). Systems such as shelterwood and continuous-canopy forestry are desirable. Factors influencing these choices include: geology, and soils and their susceptibility to erosion and slipping, the probability of large and extreme rainfall events, which harvesting systems could be used, the species chosen for production (root strength, retention of live root systems and timber value), and the extent to which the chosen scenarios achieve community values while adequately managing risks. The Task Force's four catchment papers (Maitai, Brook, Marsden and Roding) are a first attempt to do this.

Any land found to have too great a risk should be removed from production and managed back into indigenous vegetation, potentially with added compatible wide-spaced, fast-growing exotic hardwoods to provide both slope stability and a nursery for the under-planted or regenerating indigenous species. Only exotic species with no known wilding risks should be used. Protection-forest exotics would not be harvested but could be thinned (by poisoning or felling) at a later stage or left to grow and die naturally.

Other challenges for planting include the risk of damage by uncontrolled pests and uncontrolled invasions of weeds. Given the mobility of pest animals, good pest control at the landscape scale will be required before any planting and at maintenance levels thereafter (especially where the risks of vine weeds or ungulate browse are high). If funds are limited, priority should be given to pest and weed control to allow indigenous regeneration.

There is also a risk that the chosen species (exotic or indigenous) are not well-suited to the site. Expert advice and species trials may be required.

Species choice

We commend the approach taken at Silvan and now Kingsland forests as a useful model to emulate, while recognising that the successful establishment of plantings so far has not been hampered by dry summers (which will return) and needs effort to control weeds (especially banana passionfruit, old man's beard and at planting time, gorse).

NCC should work together with TDC (Kingsland Forest), Silvan Forest owners, Ngāti Koata and other neighbours in the implementation of transitioning, and draw on the experience of those doing this type of transition successfully already, including Appletons Nursery, Rob and Jan Fryer (FuturEcology), Roger May (Tomorrow's Forests), Adam Forbes (Forbes Ecology), Sean Weaver (Ekos), Rhys Millar (Ahika) and many others who attended our Technical Experts session[46] or provided valuable knowledge to support changing a land cover.

We see merit in lower planting densities and the use of seed trees, light-well planting and potentially seed spreading; all are cost-effective measures to implement transition at a large scale.

The Task Force recommendations at the stand scale may have missed some critical decision-making factors. Therefore, it may be necessary, before deciding which specific species to plant, to better assess and map current stands and areas within them, in terms of soils, slope, aspect, access, weed profile, soil moisture and any cross-boundary impacts. The GIS mapping and landscape planning used in the Boffa Miskell approach for the Silvan Forest should be considered. This also helps guide species choice (subject to the risk assessment above).

Advice from experts in suitable species is needed to support NCC's transition implementation including the planting sites, species requirements and what the neighbours and the public will want or tolerate.

Key factors in determining transition success

Of key importance are: an overall estate strategy, a realistic budget, good planning, good management, timely operations, good record keeping, reliable contractors, transparent and honest communications with the public.

We support the need for a staged transition over (say) 15 years so that revenue (if any) from commercially productive pine, under best management practice, can be used to support the costs of transition to options 2–4, including pest and weed control. This approach would also enable advance planning and the opportunity to seek grant and co-funding for stages of the transition.

Key management interventions for the Nelson forestry estate are: control of the exotic mammalian browser populations (ungulates and possums) and plant pest control, especially of shade-tolerant or structurally dominant weeds. These issues will be most efficiently managed at the landscape scale in collaboration with neighbouring landowners.[47]

[46] Ibid.
[47] A. Forbes. 2022. A Review of Native Forestry Options for Nelson City. p33. (linked; accessed 27 Oct 2023)

Risks and opportunities for transition success and key mitigations

Major risks include: running out of money to manage a site properly after the initial planting, insufficient pest control, poor quality plants or planting, unseasonable conditions and using species unfit for a site.

The transition strategy needs a focused stand-by-stand assessment to confirm our recommendations, and NCC needs to recognise that some current stand areas are either too big to suit a single scenario (1–4) and some are so small that their management could be amalgamated with adjacent areas.

We see merit in selected timber plantings, either in mixed mosaics or small coupes, with potential to supply demand for niche hardwood timbers and potentially strengthen Nelson as a focal point for fine woodworking Species could include tōtara, redwood, durable eucalypts, macrocarpa and others as recommended in Eric Appleton's list, and in discussion with tangata whenua and the other users such as the Centre for Fine Woodworking.

Key decision makers for transition planning

Ultimately, NCC needs to implement transitions with input from planning and transition experts,[48] iwi (especially its neighbours, Ngāti Koata) and the public, including interested parties potentially affected by or able to contribute to the process (e.g. mountain bike groups, trapping and reforestation groups, walkers, broader community groups).

We consider a major challenge may be funding the transition, especially if completion is desired over a short timescale (1–15 years). Strategic and thorough planning will be necessary because of the varied age of current stands and the varied availability of skilled labour and plants. Broad transition-funding options should include consideration of: net returns (if any) from pine harvest, NZU credits earned since the forests were reregistered into the ETS (current value c. $900k[49]), voluntary carbon credit potential, biodiversity credit potential, honey lease potential, grant and external funding opportunities; targeted forest-transition rate funding; infrastructure funding (e.g. as natural infrastructure) for the broader ecosystem services delivered, including flood mitigation, climate resilience, and importantly, improved water health outcomes.

We encourage NCC to actively pursue opportunities for forest transition innovation, such as those presented by Meg Graeme/Tane's Tree Trust, and discussed with the Task Force and NCC staff.[50]

Recommendations arising from this analysis

1. All existing clear-felled areas should be top priorities for transitioning.

2. Specific areas that are priorities for transition include:

    - any stand likely to return a marginal (less than 5% IRR) or negative Return on Investment (ROI), across a harvest cycle (c. 28 years)

[48] See, for example, Ahika, Ekos or Forbes Ecology, for project costing, returns and development; Boffa Miskell for landscape scale mapping and strategic planning (regarding Silvan Forest); Appleton's nursery, Tomorrow's Forests, FuturEcology for species selection and planting; Kaitaiki o Ngāhere for transition management (weed control etc).

[49] Per NCC Finance Team. 14,453 NZU credits received in May 2023.

[50] Mike Bergin, Tane's Tree Trust. 2023. Transitioning exotic forest to native forest – canopy manipulation trials.

- stands forming a visible backdrop to the city in the Matai, Brook, and Marsden catchments

- those stands likely to achieve identifiable freshwater, biodiversity or recreational value improvements.

3. Any land deemed to have too high a risk for plantation forestry should be removed from production and managed back to indigenous vegetation, possibly with added compatible wide-spaced, fast-growing exotic hardwoods (with no known wilding risks) where appropriate.

4. Develop an estate-wide pest management/control plan, to include treatments pre-planting and ongoing maintenance, with priority going to pest and weed control to allow indigenous regeneration.

5. Collaborate with iwi, community organisations and neighbourhood groups with interests in particular catchments and areas, in the strategic planning and assessing desired outcomes, such as access, tracks, forest typology (e.g. Friends of the Maitai, recreational and commercial mountain bike groups, paragliding groups, community planting, trapping, adopt-a-spot groups).

6. Use Silvan Forest and Kingsland Forest Park as examples of good practice in planning forest transitions, including their methods of landscape mapping and planning (per Luke Porter/Boffa Miskell).

7. Cooperate with TDC, Silvan Forest owners, Ngāti Koata and other neighbours, as well as experienced plant nursery sources and experienced reforestation professionals (eg. Appletons, Rob Fryer/FuturEcology, Roger May/Tomorrow's Forests, Sean Weaver/Ekos, Forbes Ecology and others), to ensure best practice and decisions in planning the forest transition.

8. Where it appears a critical factor may have been missed in the Task Force recommendations for a particular forest stand, it may be useful to carry out further assessment, for example, mapping soils, slope, aspect, access, soil moisture, and cross-boundary impacts to support a better-informed decision for that stand

9. Review cost-effective approaches to transition, including lower planting densities, improved propagation methods, lightwell planting, seed spreading and GIS mapping, to allow for best possible decisions on selected the species for planting.

10. Develop an overall estate strategy in collaboration with regional partners, iwi and the community, which would include a realistic budget, good planning, good management, timely operations, good record keeping, reliable contractors and transparent communications with the public (see also, recommendations from Paper #2, Strategic Planning and Decision-Making Framework).

11. Stage the transition over a period of 15–25 years to enable net revenue from commercially productive pine (if any), harvested under best management practice, to be used to support transition costs, including extensive pest and weed control and management.

12. Consider selected timber plantings either in mixed mosaics or small coupes, to allow for the supplying of niche hardwood timbers for a range of uses.

13. Pursue opportunities for forest transition innovation, such as those presented by Adam Forbes/Forbes Ecology, Tane's Tree Trust, Roger May/Tomorrow's Forests, Robert and Eric Appleton, Rhys Miller/Ahika, and discussed with the Task Force and NCC staff.

References

Aimers, J. 2022. NCC Forestry Report Review – Review of PF Olsen 2022 Alternative Species Options, Potential options for replanting the Nelson City Council's existing Commercial Forestry Asset. 21p.

Bell, A. 2015. NCC Review of plantations. Contract report for NCC. 32p.

Boffa Miskell Limited. 2015. Nelson Landscape Study: Visual Amenity Landscape Evaluation. Report prepared by Boffa Miskell Limited for Nelson City Council.

Catalyst Group 2016. Nelson City Council's production forests – Assessment of non-monetary values. Prepared by A. Beveridge & P. Gorman. Report 2016/066. 44p.

Catalyst Group 2022. NCC's Production Forests – where to next? A review of the 2016 Catalyst report. Prepared by G Carlyon and F Maseyk. Report 2021/171. 21p.

Ekos Consulting. 2022. Forest Carbon Opportunities for NCC. Oct 2022. S.Weavers and N.Chand. 54p.

Ennis, R. 2020. *The Wood Age – how one material shaped the whole of human history*. William Collins.

Fenemor A. D., Samarasinghe O. 2020. Riparian setback distances from water bodies for high risk land uses and activities. Landcare Research Envirolink contract report LC3832 for Tasman District Council. 43p.

Fisher, R. 2023. Far-sighted thinking. *New Scientist* March 2023: 47–49. 23.

Forbes, A.S., Richardson, S.J., Carswell, F.E., Mason, N.W. and Burrows, L.E., 2023. Knowing when native regeneration is for you, and what you should do about it. The Aotearoa New Zealand context. *New Zealand Journal of Ecology* 47(1): 3524.

Forbes, A.S. 2022. A Review of Native Forestry Options for Nelson City. 35p.

Forbes, A.S. 2021a. Restoring Exotic Plantation Clear-Fells: Guidance for northern South Island Districts. Contract report for NCC. 52p.

Forbes, A. 2021b. Review of actual restoration costs, 2021. Contract report prepared for Te Uru Rākau – New Zealand Forest Service. Havelock North, Forbes Ecology Limited. 23p.

Griffiths, J.W., Lukens, C.E. and May, R. 2020. Increased forest cover and limits on clear-felling could substantially reduce landslide occurrence in Tasman, New Zealand. *New Zealand Journal of Forestry Science*: 50.

Holl, K.D. and Aide, T.M. 2011. When and where to actively restore ecosystems? *Forest Ecology and Management* 261(10): 1558–1563.

Kaitiaki O Ngāhere. 2021. Marsden Valley Reserve Ecological Restoration Plan, 2021–2030.

Lambie, S. and Marden, M. 2020. Transitioning from exotic to native forest through natural regeneration: Benefits and risks [Envirolink Grant 210 – HBRC249]. Prepared for Hawke's Bay Regional Council. Lincoln, Manaaki Whenua – Landcare Research. 13p.

LandVision 2018. NCC Forestry Alternative Management. June 2018. 44p.

Marlborough District Council, Department of Conservation, Marlborough Sounds Restoration Trust 2016. Guidelines for converting pine plantations to native vegetation in the Marlborough Sounds. 11p.

Ministerial Inquiry into Land Uses in Tairawhiti and Wairoa. 2023. Outrage to Optimism. May 2023. 44p.

MPI [Ministry of Primary Industries]. 2023. A NZ guide to growing alternative exotic forest species. 76p. MPI Specialty Species Booklet Online July23 (canopy.govt.nz), accessed 27 Oct 2023.

MPI. 2021. Transitioning Exotic Plantations to Native Forest: A Report on the State of Knowledge.

MPI TechnicalPaper No: 2021/22. Prepared for Te Uru Rākau – New Zealand Forestry Service by Forbes Ecology. 37p.

Nelson City Council. 2021. Forestry Activity Management Plan, 2021–2031.

PF Olsen. 2022. Alternative Species Options. Potential options for replanting the NCC commercial forestry asset. Prepared by A. Clarke. 55p.

PF Olsen. 2021. Forest Management Plan 2020–2025 for the Brook, Maitai, Roding and Marsden Valley forests owned by Nelson City Council. Prepared by Kit Richards, PF Olsen Ltd. 124p.

PF Olsen Ltd. 2015. Response to Alan Bell and Associates Review of Nelson City Council Plantations Report dated 17 August 2015. Prepared by B. Horrell. 14p.

Nelson City Council. 2023. Council's Forestry Estate maps.

Parliamentary Commissioner for the Environment. 2002: Weaving Resilience into our Working Lands: recommendations for the future roles of native plants. Wellington: Parliamentary Commissioner for the Environment.

Peterson, P. and Hayman, E. 2018. Conserving indigenous fauna within production forestry landscapes. Manaaki Whenua – Landcare Research Contract Report LC3216. Envirolink Grant: 1854-GDDC150 June 2018.

Sweetapple, P. 2022. Evaluation of seedling ratio data from an ungulate control area, Nelson. Landcare Research Envirolink report LC4162.

Tane's Tree Trust. 2023. Transitioning exotic forest to native forest – canopy manipulation trials. Prepared by M. Bergin. 4p.

Tasman District Council. 2020. Kingsland Forest Park Development Plan. 55p.

Sinner, J., Fenemor, A., Kilvington, M., Allen, W. and Tadaki, M. 2012. Valuing Our Waters – A Case Study in Tasman District. Cawthron Institute Report 2107. 132pp.

Weaver, S.A. 2021. Carbon financed conservation forestry. *New Zealand Journal of Forestry Vol. 66* (1):12–17.

Wildlands Consultants Ltd. 2022. Review of methods and costs for conversion of plantation pine forest to indigenous forest in Nelson. Contract Report No. 6387 prepared by Sarah Beadel and Matthew Renner. Review of Forbes 2022. 20p.

Wildlife Management Associates. 2023. Backcountry Ungulate Management Programme Review. Consultancy report by Cam Speedy for NCC, June, 37p.

Wright, D.M., Tanentzap, A.J., Flores, O., Husheer, S.W., Duncan, R.P., Wiser, S.K. and Coomes, D.A., 2012. Impacts of culling and exclusion of browsers on vegetation recovery across New Zealand forests. *Biological Conservation* 153: 64–71.

CATCHMENT REVIEW - MAITAI

The following pages show details of commercial forest in this catchment, based on NCC's Forestry Activity Management Plan 2021-2031, with added information and commentary based on Task Force members' personal observations, as well as other data acquired during the Task Force's review.

Four Task Force members were allocated a Catchment (Forest block) to review in-depth. These four catchment authors also collaborated on their research and findings, to ensure shared understanding of common issues (such as weeds and pests) and to produce a more meaningful catchment analysis and recommendations pertaining to all catchments. Reviews involved collecting, organising, analysing, and summarising a range of data and information related to physical elements (topography, current planted species, rainfall, aspect, soil characteristics, etc.) as well as the opportunities and risks presented by the current forestry situation(s).

Catchment reviews consist of a common framework that enabled the Task Force to:

- define an approach and collate key characteristics of the area
- identify risks & opportunities
- identify all commercial forest stands, and
- make observations or note key findings for their short and long-term future management.

Each Catchment review covered these types of comparisons/analysis:

- Maps related to the Catchment area
- Parameter setting – using the Task Force Aspiration Statement and its Values Overview of the Forest Area
- An Overview of the Forest Area
- Key Elements to Consider
- Scenario Assessment – considering a range of four options/alternatives to suit NCC's forested lands, as applied to each Catchment, being:
    - Continue plantation forestry beyond the current rotation
    - Transition to alternate timber species (exotic and indigenous)
    - Transition to mixed exotic & indigenous amenity forest
    - Transition to indigenous forest via natural regeneration or replanting
- Financial/Net Revenue from Production Forestry Considerations
- Catchment Stand-by-Stand Assessment – reviewing the stands of each Catchment across the four scenarios and providing additional information for each stand (stand identifier, area, value, species, and year planted)
- Key observations
- Areas for Action for the catchment and its forest stands
- Catchment opportunities

Aspiration Statement	"A resilient, continuous canopy, forested landscape, rich in biodiversity, that supports the many values of the people of Te Tauihu and our future generations"

Values

Environmental

- Air, Soil, & Water Quality Improvement
- Flood, Sedimentation & Pest Control/Management
- Biodiversity Enhancement
- Climate Positive Outcomes

(resilience & permanent sequestration)

Social & Cultural

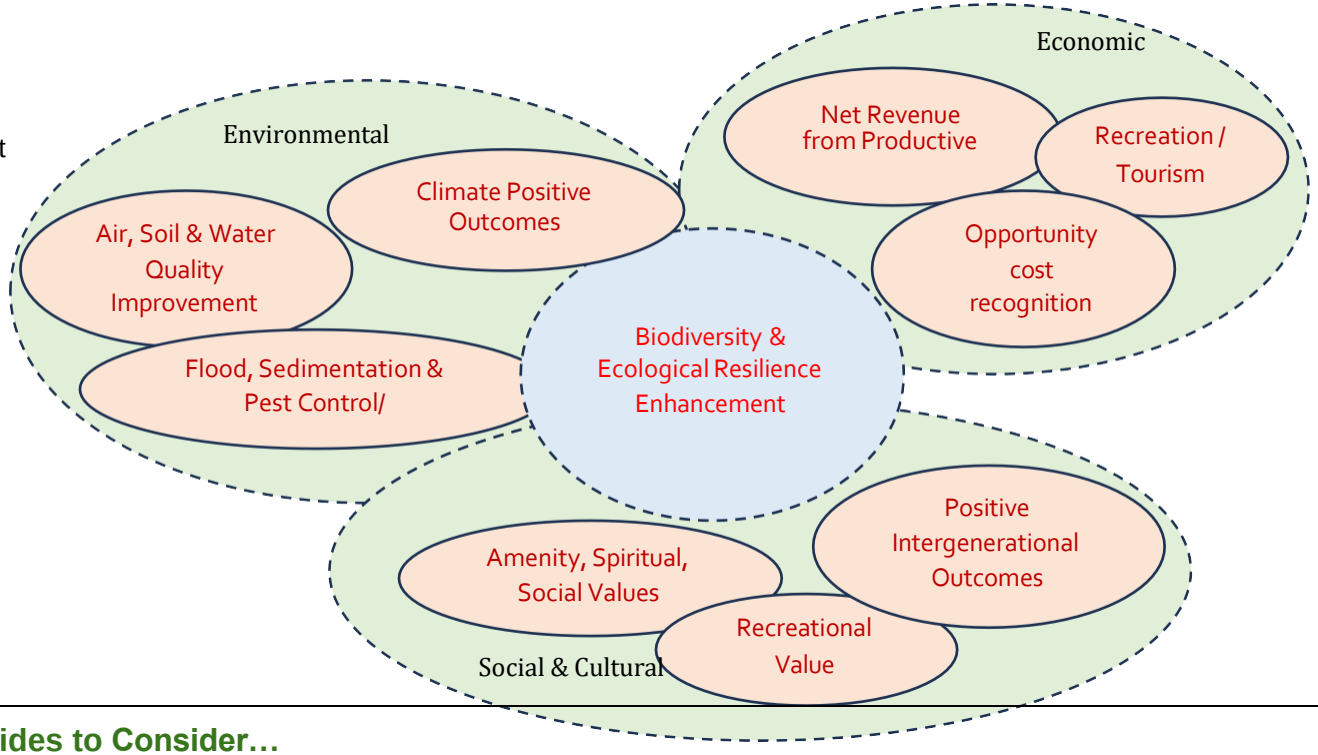
- Amenity & Spiritual
- Recreational
- Biodiversity Enhancement
- Positive Intergenerational Outcomes

Economic

- Net Revenue from Productive Uses

(tangible & intangible)

- Opportunity Cost
- Recreation / Tourism
- Biodiversity enhancement



Risks, Opportunities, Parameters, Future Guides to Consider…

A. What are the Task Force's biggest challenges?

- Establishing a credible pathway to a more resilient forest model that meets a wide range of values.
- Identifying potential 'roadblock' issues, such as:
  - Costs of transitions
  - Species mixes
  - Future uses
  - Perceptions of transition timeframes
  - Agreement on most effective societal/ institutional partnerships (shared leadership)

B. Mixed value of NCC commercial forests

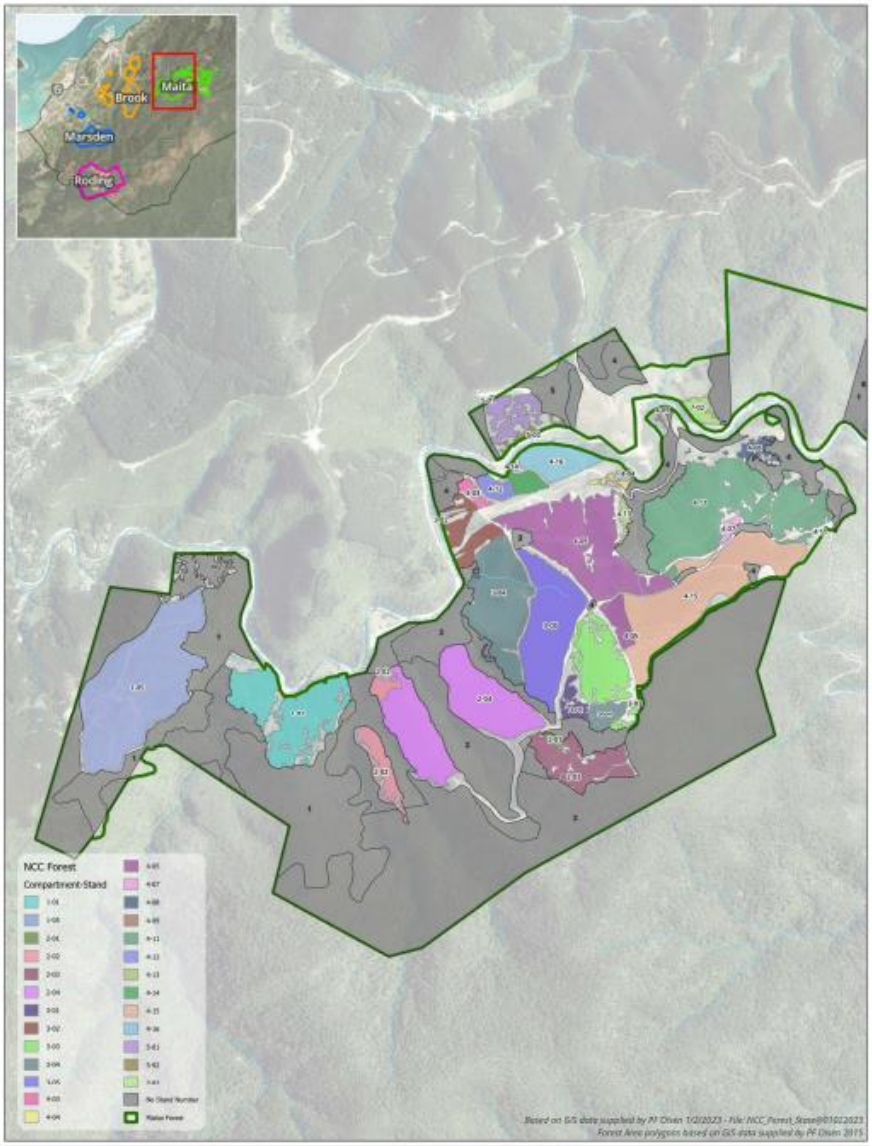
- Financial returns (net)
- Financial and social values of all production costs (employment, track development and other infrastructure – costs of production)
- Biodiversity values
- Soil and water protection values
- Recreation values
- Climate change mitigation values
- Avoiding moral hazard

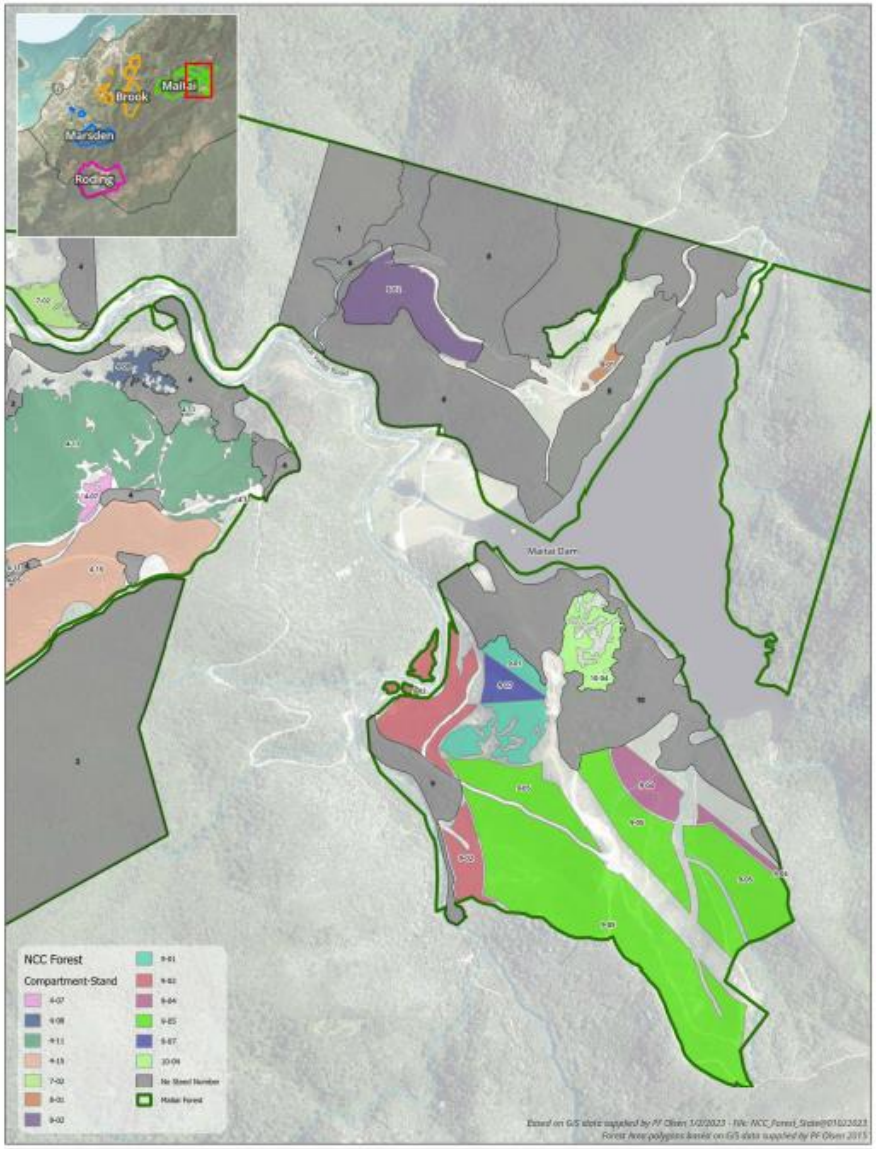
C. Innovative transformations

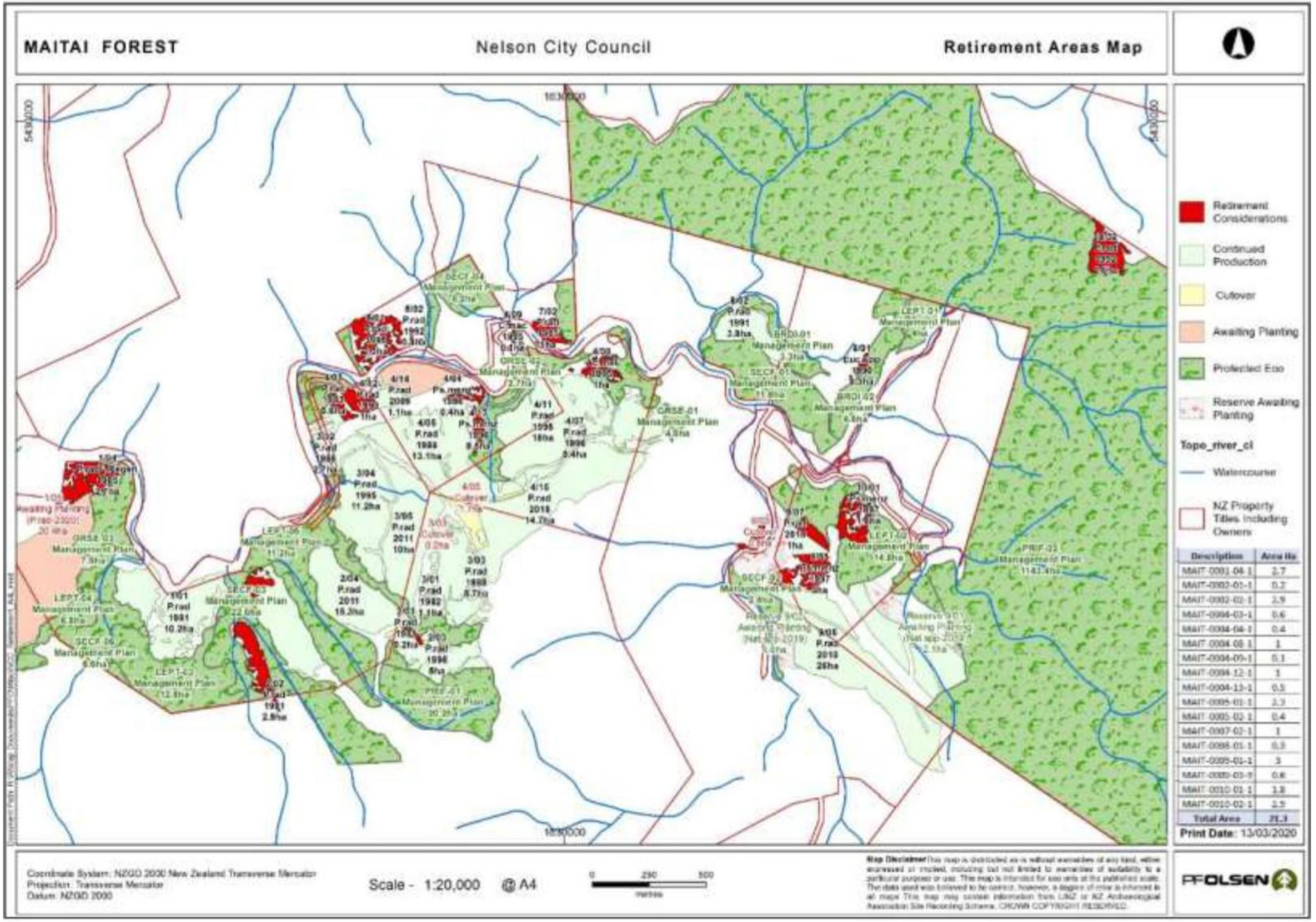
- Alternative revenue streams
- To perpetual community managed forests
- Governance structures that empower community/statutory organisations and partnerships and continuity of long-term goals and aspirations
- Forests with a wide range of species
- Forests that include some capacity for high value extraction of timbers while maintaining continuous canopies (think European models)

1. AN OVERVIEW OF THE FOREST AREA - MAPS

(view larger map here)

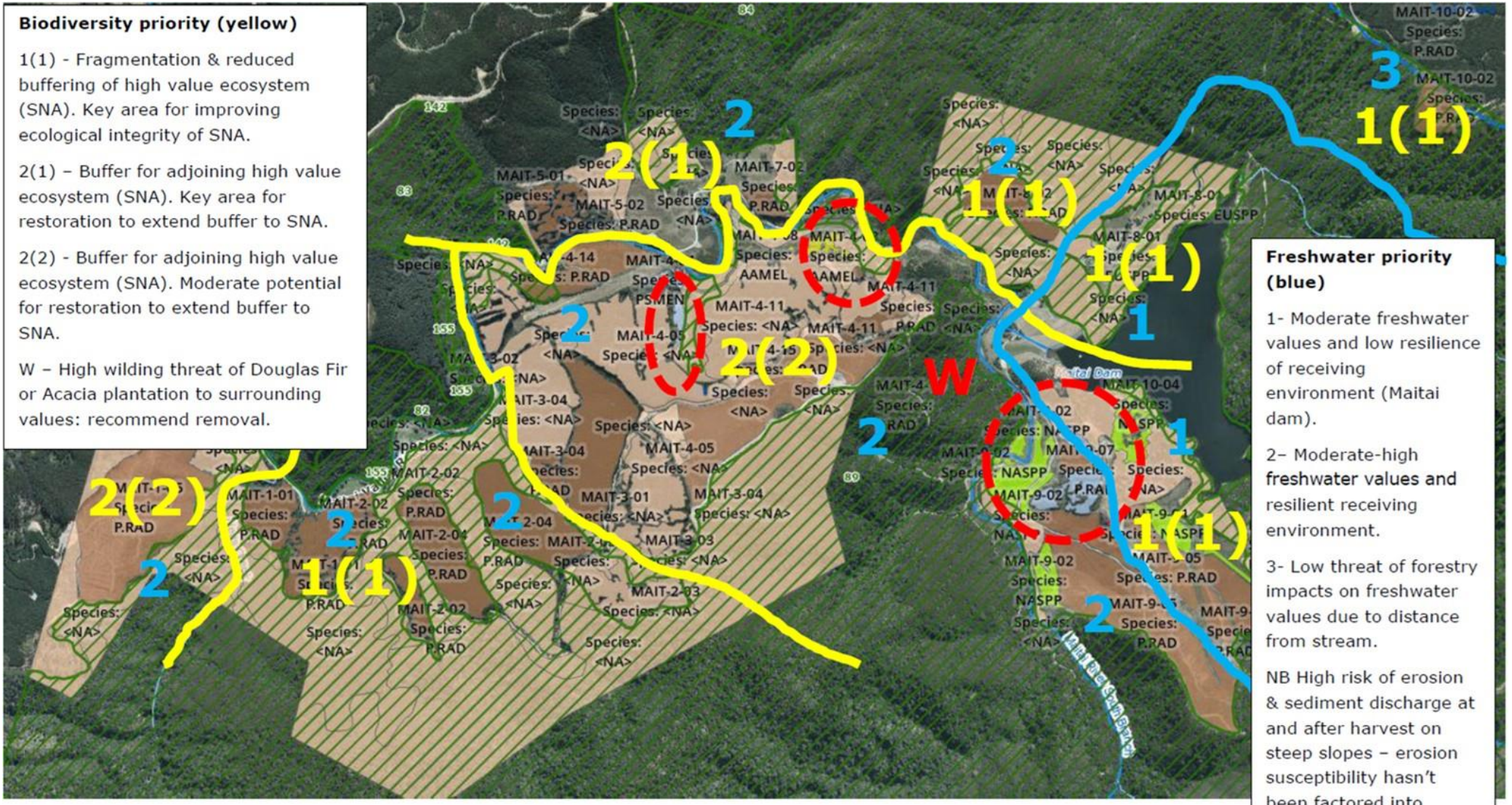






Incorporated from LandVision 2018 Report: NCC Forestry Alternative Land Management

NCC Environment & Science Team Guidance/Priorities (Maitai)



1. AN OVERVIEW OF THE FOREST AREA - DESCRIPTION

Background	The Maitai catchment is predominantly in Nelson City Council Conservation Reserve – Maitai Water Reserve. It is part of a contiguous 8,000 ha SNA. Also part of Nelson Halo.[1] See Halo map.[2] Main water supply for Nelson City. The catchment is of high risk from extreme weather events affecting landscape erosion and security of water supply and flooding to Nelson City[3]. Maitai River (upper, middle and lower) is highly valued for mahinga kai, recreation, natural and scenic values. Water quality is of primary concern to residents according to a 2015 survey.[4] Following 2022/2023 weather events it is likely that flooding and erosion are of concern too.
History	Maitai or Mahitahi refers to either working together as one, or the historical abundance of whitebait (inanga), eel (tuna) grayling (upokororo) and argillite (pakohe). The area is important to Ngāti Kuia, Rangitāne, Ngāti Koata, Ngāti Rarua, Ngāti Tama and Te Ātiawa, Ngāti Toa Rangatira (all have Statutory Acknowledgement over the Maitai River). Abundant wetlands and the lower river were fundamentally altered by early settlement in the 1840s and subsequent urbanisation. Trout introductions led to abundant fishery, now scarce. Maitai Dam (est 1987) is Nelson's main water supply (75%) supplemented by Roding (est 1941). Commercial forests were proposed from 1976 and planting began in 1981 with opposition from 'Friends of the Maitai' (est 1977) who have been instrumental in arboretum and replanting/wetland restoration. Currently, NCC commercial forest estate in the Maitai catchment includes 189.45ha across 38 compartments. 56.6ha (30%) are currently unstocked (i.e. recently harvested). Most of the remaining timber is Pinus radiata, with small areas of other species including 3.96ha (2%) Douglas fir, 1.4 ha (1%) Macrocarpa, Tasmanian blackwood or Eucalyptus. A quarter of the production forest is in the water reserve area (blocks 9 and 10). Recent Council-adopted **biodiversity strategies** include goals to protect natural ecosystem areas from development and threats, and restore ecological connections linking mountains to sea (e.g. Te Mana o te Taiao[5], Kotahitanga mō te Taiao Strategy[6]); with specific goals to progressively retire NCC plantations to native forest and manage impacts to the native forest and mineral belt ecosystems (Nelson Biodiversity Strategy[7], Nelson Nature Strategy[8]).

1 http://www.nelson.govt.nz/environment/nelson-nature/natural-environment/the-nelson-halo/
2 http://www.nelson.govt.nz/assets/Environment/Nelson-Nature/GIS-Nelson-Nature-Nelson-Halo-Operational-Area-15JAN2020.pdf
3 Erosion susceptibility maps are currently being updated (by end 2023) by Sustainable Land Management Program, which also has funds to plant 30,000 trees but will probably target agricultural land use.
4 Nelson City Council Roding and Maitai Rivers User Survey 2015
5 https://www.doc.govt.nz/globalassets/documents/conservation/biodiversity/anzbs-2020.pdf
6 https://www.nature.org/en-us/about-us/where-we-work/asia-pacific/new-zealand/stories-in-new-zealand/new-zealand-alliance/
7 https://www.nelson.govt.nz/assets/Environment/Downloads/Biodiversity/Nelson-Biodiversity-Strategy-Version-8.4-August-2018.pdf
8 http://www.nelson.govt.nz/assets/Nelson-Nature-Strategy-2017-2020-progress-update-2023.pdf

Variety of landscape	Steep hill country with forest blocks near Maitai River (blocks 1-8) and Maitai Dam (blocks 9-10). History of slips including 2 major slips in August 2022 affecting access and operations. In September 2022 proposal to retire 24ha due to poor economic returns (roading and harvest costs), proximity to the water pipeline, powerlines and Maitai River (part blocks 3.04, 4.11), or surrounded by natives (blocks 2.03) via natural regen and assisted regen[9]. An earlier 2022 report recommended large parts of this forest be transitioned away from pine production via passive regeneration with pest control (26.3 ha); assisted regeneration with pest control (158.4 ha) and continuous forestry cover (51.4 ha)[10]. Some forest areas (blocks 2, 8-10) are notable 'disturbance keyholes' within the SNA, providing avenues for weed and pest infiltration. From Forbes (2020) – The setting within extensive native forest provides a good seed source for native transition. Historically rimu-broadleaved-beech forest. Pest plants are manageable with mainly gorse providing a good nursery crop. Browsing animals (deer and possum) are a significant problem. Maitai River (only 11km long) has good stream health but degrading trends in suspended fine sediment at 3 out of 4 monitoring sites[11]. The sediment load (to river and estuary) has been attributed to recently harvested forest, pine forest subsoils and hill country pasture[12]. A correlation between increasing forestry and instream sediment and decreasing stream health has been documented[13]. Fine sediment, alongside dissolved inorganic nitrogen, is thought to drive Microcoleus (toxic cyanobacteria) blooms in the river, which can cause dog death on ingestion[14]. The most recent biomonitoring shows that the river below Matiai reservoir has high temperatures (ongoing breaches of consent conditions), periphyton indicating nutrient enrichment, and declining MCI – worse downstream associated with temp, nutrients and sediment[15]. The Maitai reservoir undergoes stratification and develops a deoxygenated hypolimnion each summer. This leads to the release of metal ions and phosphorus from the sediments, which can enhance Lindivia levels making reservoir management for water supply intensive/expensive, or affect downstream water quality leading to negative environmental outcomes. "Phosphorus has spiked in the reservoir in recent years as a result of forestry operations in the North Branch catchment".[16] Maitai River flows into Te Tai o Aorere/Nelson Haven estuary, highly valued for biodiversity, fishing, recreation, aesthetics, and economic trade at Nelson Port. The Haven has a moderate-high vulnerability rating due to high levels of sedimentation, localised eutrophication, and toxicity due to land use effects exacerbated by climate change[17].

[9] Nelson City Council Forestry Subcommitee Forestry Update – Number 20
[10] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.26.
[11] Land Air Water Aotearoa - Mahitahi: accessed August 2023
[12] Gibbs & Woodward (2017). CSSI-based sediment source tracking study for the Maitai River, Nelson. NIWA client report 2017256HN.
[13] Aristi et al (2017). Forestry influences the abundance of Phormidium-dominated biofilms and the functioning of a New Zealand river ecosystem. Marine and Freshwater Research 68:1741-1751.
[14] Wood et al (2007). First report of homoanatoxin-a and associated dog neurotoxicosis in New Zealand. Toxicon 50: 292–301.
[15] MacNeil & Kelly (2023). Maitai River Biomonitoring: 1 July 2021–30 June 2022. Cawthron Report No. 3831.
[16] Novis & Schallenberg (2020). Lindavia intermedia in the Maitai Reservoir, Nelson, and the risk of lake snow formation. Manaaki Whenua – Landcare Research Contract Report: LC3739.
[17] Stevens & Robertson (2017). Nelson Region estuaries: vulnerability assessment and monitoring recommendations. Wriggle Coastal Management.

2. KEY ELEMENTS TO CONSIDER

Key Element for this Forest	Describe Current Situation	Risks? (& their likelihood)	Opportunities? (& their likelihood)
Water catchment	● 75% of Nelson water supply ● 25% of Maitai production forest upstream of Maitai reservoir/Dam	● Medium/High risk of storm damage to water main infrastructure ● High risk of storm damage to road access to water infrastructure ● Medium risk of increased sediment and nutrients into reservoir associated with harvest effects WQ and operational costs required to mix water	● Moderate/high likelihood of improved water quality in reservoir (and associated lower operational costs) if sediment input is reduced by permanent land cover. ● Dominant reserve landscape, established beech and podocarp forest provides resistance to storm risks and helps moderates flood flows
Slopes/flats – topographical details – challenges – by compartment	● Forest on steep slope with poor access – 2.01 (native regen?) ● Forest on steep slope needing soil stabilisation – 2.2 (regen/exotic?) ● Forest on steep slope with low-risk erosion but minimal topsoil and close to River – 4.03, 4.04, 4.06, 4.08, 4.09, 4.12, 4.13 (regen/native plant/non-harvest?) ● Steep riverside blocks cannot be harvested under NES 'spray and walk away' – 1.04, ● Steep slope with low-risk erosion but minimal topsoil and close to road – 5.01, 5.02, 7.02 (regen?) ● Moderate slope above reservoir but adjacent to indigenous – 8.01 (regen/non-harvest?) ● Steep slope with low-risk erosion but minimal topsoil and above reservoir – 9.01, 10.01, (needs forest cover) ● Moderate slope with low-risk erosion but minimal topsoil above reservoir – 10.02 (natural regen) ● Flat with riparian values above reservoir – 9.03 (natural regen)	● High risk of erosion associated with harvest of some blocks ● Medium/increasing risk of lower river flooding associated with non forested catchment	● Medium opportunity of stabilisation of steep areas

Tourism	● Mountain biking overlap with recreation. In 2018, predicted $14.5 million in expenditure, $7.5 million in GDP and total additional employment of 106 FTEs[18] ● Nelson City and Bays tourism – walks, kayaking, fishing, sailing	● Medium risk of lost tourism revenue due to limited access during harvesting ● Medium risk of injury due to windfall (mitigated by not replanting) ● High risk fire excluding tourists	● Medium/high opportunity for increased GDP from mountain biking if create attractive, accessible trails; provide benefit also to walking/running ● Medium opportunity for tourism links to lower river (e.g., high visitation in city) if river quality maintained
Recreation	● Mountain biking ● Walking, hiking, running, swimming	● Medium risk of injury (mitigated by closing access during harvest)	● Medium opportunity to maintain human-nature connection with accessibility to mid-upper catchment via Maitai River Rd and lower reaches in city
Cultural/amenity aspects	● Access, strong association, picturesque, iconic, river use ● Argillite, mahinga kai	●	● As above ● Low well-being improved by access to nature, cleaner air (less pine pollen)
Harvest history – revenue, costs, known challenges	● Budgeted income 2022 $3.89M minus direct cost $2.89M, 2024 $2.18M minus direct cost $1.74, 2025 $0.18M minus direct costs $0.23M. Low to medium earner compared to other forest holdings ● Some blocks are uneconomic to harvest.	● High fire risk (mitigated by pruning/thinning near high public use areas) ● High risk loss of revenue due to market fluctuation, mitigate by not harvesting/poison (e.g., 1.04, 4.08, 4.09,4.13, 5.01, 5.02)	● Low opportunity of income from alternate species?
Pests – (plant & animal)	● Gorse, deer, possum, wilding pines ● Despite part of Nelson Halo, production forests generally no predator control ● Douglas fir has high invasion potential and constitutes 8.8 ha – 4.04 (harvested), 4.13 (poisoned), 9.01 (poisoned), 10.01 (poisoned); now blocks require active weed control/replanting ● Some blocks surrounded by indigenous forest are ‘keyholes’ for disturbance	● Medium risk that keyholes allow invasion of pests (e.g., 2.02,8.01, 10.02) and/or require active weed management (e.g. 4.03, 4.04, 4.06, 4.08, 4.09, 4.12, 4.13, 9.01, 9.03, 10.02) ● Low risk negative herbicide effects (mitigated by using Green glyphosate and BMPs)	● Low opportunity - improvement due to removal of intro seed sources and pest habitat (low because small area of catchment)
Biodiversity	● Blocks part of or adjacent to contiguous 8,000 ha SNA, Nelson’s highest biodiversity value sites	● Medium risk also to instream biodiversity from poor WQ associated with forestry harvest ● Soil biodiversity is rarely considered but key to future options.	● Low improved spatial connectivity (only low because forest area a small part of catchment)

[18] Cox et al (2018) Nelson Mountain Biking Economic study. BERL Report No. 5851.

3. SCENARIO ASSESSMENT

Forest Area assessed against these Values criteria. Note the scoring, 1-5, with 1 being low value/poor outcome, and 5 being high value/beneficial outcome.

	Transition / Continuation								
Value ➔ & Scenario ⬇ 1=low / 5=high	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (X out of 40)**
Plantation Pine (clearfell management)	- Known costs. - Net revenue variable. Some stands are uneconomic to harvest. - Weed, animal and wilding pine control costs need to be attributed to forestry account (will increase costs, decrease net return). - Riparian buffers need to be enhanced (will increase costs, decrease net returns).	- Damage to infrastructure if trees fail during storms - Increased erosion, slip, sediment risk at harvest. - Sedimentation of reservoir affecting water treatment costs - Fire risk. - Conflict with recreational users and loss of social licence. - Negative impact on broader regional economic outcomes (recreational tourism).	- Variable and low returns expected despite good access and scale of many stands. Management costs are high and complex. E.g. D.fir blocks are poisoned and need replanting. - Carbon footprint of management and log exports.[19]	- Along road and river and accessible areas above the reservoir negatively impacted	- Can support recreational outcomes in part, but significant negative impacts when access is lost due to harvest, fire risk. - Negatively impacts tourism economic outcomes[20].	- Pine forests don't provide food for native species - Frequent habit disturbance with harvesting activities. - Less diversity of species in monoculture plantations, although some native vegetation dispersed - Impact on soil biodiversity inconclusive	- Moderately beneficial to air and water unless harvesting and in years after harvest. - Pine pollen is seen as a pollutant and irritant for some. - Nutrient removal in harvest; soil compaction due to heavy equipment.	- Flood control is beneficial except 1-8 years after harvest. - Pest plants are not well managed in NCC production forests. Vector for infecting adjacent native forests (SNA). - Sedimentation of waterways and marine environment concerning during harvest cycle (need better riparian and roadways management)	
Score / Total	**2**	**1**	**1**	**1**	**2**	**2**	**3**	**2**	**14 / 40**
Alternative continuous cover species (native and/or exotic)	- Planting costs higher than pine - but for longer term investment. - Revenue higher per m3.	- Weed and pest control. - Fire risk during establishment.	- Potential higher value timber revenue realised over a longer term.	- Community support for transition away from clearfell forestry likely.	- Regional economic return from recreational use (mountain biking, MTB) is significant, as	- Less habit disturbance over a longer harvest cycle. - Tree species can be selected	- Beneficial to air and water unless harvesting and in years after harvest (which will be less due to	- Enhanced outcomes due to less soil disturbance. - Active weed and pest	

[19] Miner, R. (2010). Impact of the global forest industry on atmospheric greenhouse gases. Food and Agriculture Organization of the United Nations. Also, IPCC AR6 chapter (2023). https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_07.pdf

[20] McIndoe C., Rahman M., and Dixon H. (2023). Mountain biking – the economic risk and opportunity facing Nelson Tasman. BERL. p.1.

	- Weed and pest control costs may be offset by non-timber returns (grants, co-funding).	- Planting failure - Unpredictable markets	- Non-timber revenue sources possible (honey lease etc). - Voluntary carbon and biodiversity market potential.		long as access isn't restricted - Tree species can be selected to enhance opportunities	to enhance biodiversity restoration and resilience.	longer time frames and select harvest - Tree species can be selected to enhance soil outcomes	management needed. - Plantings also act as riparian buffers (also need good roadways management).	
Score / Total	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**26 / 40**
	Transition / Continuation								
Value ➔ & Scenario ⬇	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (x out of 40)**
Mixed native & exotic amenity forest	- Planting costs higher than pine - but for permanent forest investment. - Weed and pest control costs may offset by grants, co-funding, non-timber returns (eg. honey lease etc). - Potential savings from infrastructure protection / access to upper Matai	- Weed and pest control - Fire (and drought) risk during establishment. - Planting failure.	- Potential non-timber income sources: lease for honey; recreational user access permits; external grant and co-funding.[21] - Voluntary carbon and biodiversity market potential.	- Positive, where seen from road or by reservoir recreational paths - Potential community building and involvement. - Community support for permanent afforestation.	- Significant economic return (mountain biking), when access is not restricted.[22] - Also, walking, running, orienteering, national cycle trail, but may want to limit in water catchment	- Permanent forests support significantly less habit disturbance. - Tree species can be selected to enhance biodiversity. .	- Permanent forests provide for air, soil and water outcomes. - Very long term carbon sequestration. - More resilient town water supply	- Re-establishing the canopy key to mitigating risk on steep slopes. Faster growing exotics could be a nursery for slower natives. - Enhanced outcomes due to less soil disturbance. - Active weed and pest management needed.	
Score / Total	**2**	**3**	**3**	**5**	**5**	**4**	**5**	**5**	**32 / 40**
Native forest via natural regen (NR) and/or active planting (AP)	- Planting costs higher, but for permanent forest investment. - Weed and pest control costs may offset by grants, co-funding, non-timber returns (eg. honey lease etc).	- Weed and pest control - Fire (and drought) risk during establishment. - Planting failure. - Longer transition window to establishment.	- Voluntary carbon and biodiversity market potential. - Potential other income sources: lease for honey; recreational user access permits; external co-funding.	- Positive, where seen from road or by reservoir recreational paths - Kaitiakitanga enhanced. - Nature immersion and connection. - Potential community	- Economic benefit as above. - Enhanced outcomes. - Also walking, running, orienteering, national cycle trail, nature immersion / connection, but may want to limit	- Significantly less habit disturbance. - Species directly provide for indigenous biodiversity outcomes. - Adjacent to private land with mixed land use; but already	- Native permanent forests provide for best air, soil and water outcomes. - More resilient town water supply - Part of Maitai riparian management	- Enhanced outcomes due to less soil disturbance. - Part of Maitai riparian management plan and Maitai reserve; although small areas	

[21] Excellent example: https://www.rnz.co.nz/national/programmes/countrylife/audio/2018899442/the-whanganui-forest-which-never-stopped-growing-opportunity
[22] McIndoe C., Rahman M., and Dixon H. (2023). Mountain biking – the economic risk and opportunity facing Nelson Tasman. BERL. p.14.

	- Potential savings from infrastructure protection / access to upper Matai	- Need to meet ETS?	- (NR) most economical option.	building and involvement. - (NR) Gains realised more slowly	in water catchment	dispersed with native veg with high growth rates due to southern planting, maybe ETS option. Weed species will need to be addressed.	plan and Maitai reserve; although small areas - Very long term carbon sequestration. - (NR) Gains realised more slowly.	- Active pest management needed. - (NR) Erosion risks are mitigated more slowly.	
Score / Total	**2**	**3**	**3**	**5**	**5**	**5**	**5**	**4**	**32 / 40**

4. FINANCIAL / NET REVENUE FROM PRODUCTION FORESTRY CONSIDERATIONS

Per stumpage summary below,[23] key stands of interest being considered (by PF Olsen) for continuation in production forestry, would be those with a positive stand value. **However**, stands with a similar/higher valuation, in Maitai catchment (eg. Mait 4-05, 13.1ha, 2021 stumpage valuation $44,011ha), have only realised a 2022 harvest net return of $13,333ha, 30% of book valuation.[24] The inference is that the realised return on these Maitai forests could be significantly less than projected/valuation.

Forest	Stand	Planted Year	Yield Table	NSA (ha)	Age of Clearfell	Stumpage Value ($/ha)	Stand Value/Cost
MAIT	0001-01	1981	29833CF-S25	10.3	43	-19,327	-$ 198,100.21
MAIT	0001-05	2020	MAIT-F600-S25	20.4	26	22,714	$ 462,920.34
MAIT	0002-02	1981	29833CF-S25	2.9	43	-2,708	-$ 7,962.38
MAIT	0002-04	2011	MAIT-F600-S25	15.3	28	27,292	$ 417,022.53
MAIT	0003-02	1986	29839CF-S25	0.0	37	25,613	$ -
MAIT	0003-04	1995	41805CF-S25	1.7	44	67,639	$ 117,015.14
MAIT	0003-05	2011	MAIT-F600-S25	9.9	28	27,292	$ 271,282.98
MAIT	0004-04	1986	29829MR-S25	0.5	38	-11,608	-$ 5,223.70
MAIT	0004-12	1993	41799CF-S25	1.0	38	-17,150	-$ 16,806.78
MAIT	0004-14	2009	MAIT-F600-S25	1.1	22	-7,602	-$ 8,590.66
MAIT	0004-15	2018	MAIT-F600-S25	14.0	28	27,292	$ 382,361.62
MAIT	0004-16	2020	MAIT-F600-S25	3.2	26	22,714	$ 72,004.78
MAIT	0005-01	1995	41809CF-S25	2.3	28	-17,123	-$ 38,697.28
MAIT	0005-02	1992	41804CF-S25	0.4	31	-13,136	-$ 5,779.77
MAIT	0007-02	1993	41800CF-S25	1.0	30	23,777	$ 23,063.47
MAIT	0008-02	1991	41803CF-S25	3.8	33	20,621	$ 78,770.71
MAIT	0009-01	1997	29847MR-S25	3.0	27	-339	-$ 1,011.21
MAIT	0009-05	2018	MAIT-F600-S25	26.0	28	27,292	$ 708,501.62
MAIT	0009-07	2018	MAIT-F600-S25	1.0	28	27,292	$ 28,110.81
MAIT	0010-02	1992	41810CF-S25	2.5	40	47,785	$ 120,897.19

[23] PF Olsen. (2023). Updated valuation from Sam Nuske for NCC trees task force.
[24] Stuart Orsman. (2023). Tree Crop Market Value by Stand Reconciliation. Table 1. Row 37. Columns AF-AK.

5. MAITAI CATCHMENT STAND-BY-STAND ASSESSMENT

NOTE: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

ETS note: These stands are registered in the ETS (stock change), and should be considered for managed transition (to avoid liabilities) and to establish as permanent forests in the ETS, accruing NZU returns indefinitely: 1.03 (now 1.05), 5.01, 3.01, 2.03, 7.02, 8.02

Stand information per master stand list					**Assessment against scenarios (all of which produce tall canopy forests)**				
Stand Number	Area (ha)	Value ($) / ha	Species	Year planted / established	1) Plantation forestry (pinus radiata) **Scenario (1A**) grow to maturity, transition after harvest **Scenario (1B)** active transition before maturity	2) Alternative continuous cover timber species (native and/or exotic)	3) Mixed native and exotic amenity forest tree cover	(4) Native forest tree cover via: (P) active planting; or (AR) assisted regeneration: or (PR) passive regeneration	Comments Code: PFO = PF Olsen UMo = Under management of Wildings = wilding pines
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇									
MAIT 1.04	-	NA	P radiata	NA			✓✓	P ✓✓✓ AR ✓✓✓	Poisoned circa 2021. Check status. Manage weeds, pests, wildings. Planting and assisted regeneration. Operational issues with dead canopy overhead.
MAIT 2.01	0.23	NA	P radiata	1981				AR ✓✓✓	Poison/fell unharvested trees, then native regeneration.[25] **Urgent** and ongoing need to manage weeds, pests, wildings. Assisted regeneration. Already has established shrub in places and good reversion potential.
MAIT 2.03	5.08	**ETS**	NA	0		✓✓		P ✓✓✓ AR ✓✓✓	Clearfell harvested 2021-22. Registered in the **ETS** (stock change). Plan for permanent forest. Planting and assisted regeneration. **Urgent** and ongoing need to manage weeds, pests.

[25] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.43-44.

MAIT 3.01	1.14	**ETS**	NA	0		✓✓		P ✓✓✓ AR ✓✓✓	Clearfell harvested 2021-22. Registered in the **ETS** (stock change). Plan for permanent forest. Planting and assisted regeneration. **Urgent** and ongoing need to manage weeds, pests.
MAIT 3.02	2.72	25,613	NA	1986			✓	AR ✓✓✓	**Check status**. If vacant, **urgent** need to manage weeds, pests, wildings. **Riparian** intervention needed. Plan for assisted regeneration.
MAIT 3.03	5.88	NA	NA	0		✓✓		P ✓✓ AR ✓✓✓	Clearfell harvested 2021-22. Plan for permanent forest with planting or assisted regeneration. **Urgent** and ongoing need to manage weeds, pests, wildings.
MAIT 4.03	0.61	NA	NA	0			✓	AR ✓✓✓ PR ✓✓✓	**Check status**. **Riparian** intervention needed. Plan for passive or assisted regeneration. Manage weeds, pests, wildings.
MAIT 4.05	14.57	NA	NA	0		✓✓		P ✓✓ AR ✓✓✓	Clearfell harvested 2022. Plan for permanent forest with planting or assisted regeneration. **Urgent** and ongoing need to manage weeds, pests, wildings.
MAIT 4.07	0.48	NA	NA	0		✓✓		P ✓✓ AR ✓✓✓	Clearfell harvested 2022. Plan for permanent forest with planting or assisted regeneration. **Urgent** and ongoing need to manage weeds, pests, wildings.
MAIT 4.11	18.06	NA	P. radiata	1995		✓✓		AR ✓✓✓	**Check status**. Harvest / poison / fell residual pines to waste. Plan for assisted regeneration. **Urgent** and ongoing need to manage weeds, pests, wildings.
10 stands	**~ 48.77 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇									
MAIT 1.01	10.25	-19,327 ETS ??	P radiata	1981		✓✓		AR ✓✓✓	Contains historic gravesites.[26] Harvest and use funds to support assisted regeneration (possibly in longer term). Could leave as is in the short term.

[26] PF Olsen. (2020). Forest Management Plan FSCGS04. p.16-17

MAIT 2.02	2.94	-2,708	P radiata	1981		✓✓		AR ✓✓✓	Accessibility issues support leave as is. Harvest / poison / fell to waste. Plan for assisted regeneration. Manage weeds, pests, wildings.
MAIT 4.04	0.45	-11,608	D fir	1986			✓	AR ✓✓✓	Harvest / poison / fell to waste. **Riparian** intervention needed. Plan for assisted regeneration. Manage weeds, pests, wildings.
MAIT 8.02	3.82	20,621 **ETS**	P radiata	1991	1A ✓✓✓ 1B ✓✓✓			AR ✓✓✓	Registered in the **ETS** (stock change). Harvest issues support leave as permanent carbon forest. Plan for transitional forestry. Planting and assisted regeneration. Manage weeds, pests. Tane's Tree Trust is interested in undertaking a forest transition trial on this site or 10.02.
MAIT 9.01	2.98	-339	D fir	1997	1B ✓✓✓ and >>	✓✓✓		P ✓✓✓ AR ✓✓✓	Recommended as part of 51ha continuous canopy native timber forestry park.[27] Prioritise and plan for transitional forestry park. Riparian management needed (upstream of water intake). Manage weeds, pests, wildings.
MAIT 9.02	5.17	NA	NA	2019		✓✓✓		P ✓✓✓ AR ✓✓✓	Currently unplanted regenerating wilding pine. Recommended as part of 51ha continuous canopy native timber forestry park (except small NW patch).[28] Prioritise and plan for pine removal and transitional forestry park. **Urgent** and ongoing need to manage weeds, pests, wildings. **Riparian** intervention needed (upstream of water intake).Plant to avoid pre-1990 land liabilities.

[27] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.27.
[28] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.28.

MAIT 9.04	2.07	NA	NA	2019		✓✓✓		P ✓✓✓ AR ✓✓✓	Recommended as part of 51ha continuous canopy native timber forestry park.[29] Prioritise and plan for transitional forestry park. Riparian management needed (upstream of water intake).Manage weeds, pests, wildings.
MAIT 9.05	25.96	27,292	P radiata	2018	1B ✓✓✓ and >>	✓✓✓		P ✓✓✓ AR ✓✓✓	Recommended as part of 51ha continuous canopy native timber forestry park.[30] Prioritise and plan for transitional forestry park. Riparian management needed (upstream of water intake and Maitai reservoir). Manage weeds, pests, wildings.
MAIT 9.07	1.03	27,292	P radiata	2018	1B ✓✓✓ and >>	✓✓✓		P ✓✓✓ AR ✓✓✓	Recommended as part of 51ha continuous canopy native timber forestry park.[31] Prioritise and plan for transitional forestry park. Manage weeds, pests, wildings.
MAIT 10.02	2.53	47,785	P radiata	1992	1B ✓✓✓ and >>			AR ✓✓✓	Prioritise and plan for transition and assisted regeneration. Manage weeds, pests, wildings. Tane's Tree Trust is interested in undertaking a forest transition trial on this site or 8.02.
MAIT 10.04	1.84	NA	NA	2019	1B ✓✓✓ and >>			P ✓✓✓ AR ✓✓✓	Adjacent to Maitai Dam. Priority for transition. Manage weeds, pests, wildings (poison/fell). Planting and assisted regeneration. Riparian management needed.
11 stands	**~ 59.04 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇									
MAIT 1.05	20.38	22,714	P radiata	2020	1B ✓✓✓	✓✓	✓	P ✓✓✓ AR ✓✓✓	Very young pines. Access to the top of the stand via Tasman Pines. Consider active transition. Manage weeds, pests, wildings. Planting and assisted regeneration.

[29] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.27.
[30] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.28.
[31] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.28.

MAIT 2.04	15.28	27,292	P radiata	2011	1A ✓✓✓ then >>	✓✓		AR ✓✓✓	Due for mature harvest ~2039. Plan for assisted regeneration after harvest. Manage weeds, pests, wildings.
MAIT 3.04	1.7	67,639	NA	1995	1A ✓✓✓ then >>			AR ✓✓✓	Small area left to harvest (very uneconomic due to triple handling of logs). **Riparian** intervention needed. Plan for assisted regeneration. Manage weeds, pests, wildings.
MAIT 3.05	9.94	27,292	P radiata	2011	1A ✓✓✓ then >>	✓✓		AR ✓✓✓	Due for mature harvest ~2039. Plan for assisted regeneration after harvest. Manage weeds, pests, wildings.
MAIT 4.08	0.98	NA	Acacia melanoxylon	1995			✓✓	PR ✓✓✓	Passive regeneration. Riparian management needed. Manage weeds, pests, wildings. Sci/Env team have concerns about leaving these acacias standing.
MAIT 4.09	0.11	NA	Macro-carpa	1995			✓✓	PR ✓✓✓	Passive regeneration. Riparian management needed. Manage weeds, pests, wildings. Check if any Sci/Env team concerns about wilding threat.
MAIT 4.12	0.98	-17,150	P radiata	1993			✓✓	AR ✓✓✓	Harvest / poison / fell residual pines to waste. Plan for assisted regeneration. Riparian management needed. Manage weeds, pests, wildings.
MAIT 4.13	0.53	NA	D fir	1996				AR ✓✓✓	Harvest / poison / fell to waste. Plan for assisted regeneration. Manage weeds, pests, wildings.
MAIT 4.14	1.13	-7,602	P radiata	2009	1B ✓✓✓		✓	P ✓✓✓ AR ✓✓✓	Due for mature harvest ~2037. Harvest / poison / fell to waste. Prioritise and plan for transitional forestry. Riparian management needed. Manage weeds, pests. Planting and assisted regeneration.
MAIT 4.15	14.01	27,292	P radiata	2018	1A ✓✓ 1B ✓✓✓		✓	AR ✓✓✓	Due for mature harvest ~2046. Prioritise and plan for transitional forestry. Riparian management needed. Manage weeds, pests. Planting and assisted regeneration.

MAIT 4.16	3.17	22,714	P radiata	2020	1B ✓✓✓		✓	AR ✓✓✓	Harvest / poison / fell to waste. Plan for assisted regeneration. Riparian management needed. Manage weeds, pests, wildings.
MAIT 5.01	2.26	-17,123 **ETS**	P radiata	1995		✓✓		AR ✓✓✓	Registered in the **ETS** (stock change). Plan for transitional forestry. Progressively harvest/poison/fell to waste. Planting and assisted regeneration. Manage weeds, pests.
MAIT 5.02	0.44	-13,136	P radiata	1992		✓✓		AR ✓✓✓	Harvest / poison / fell to waste. Access issues support leave as is. Plan for assisted regeneration. Riparian management needed. Manage weeds, pests, wildings.
MAIT 7.02	0.97	23,777 **ETS**	P radiata	1993	1B ✓✓✓		✓	P ✓✓✓ AR ✓✓✓	Registered in the **ETS** (stock change). Plan for transitional forestry. Planting and assisted regeneration. Riparian management needed. Manage weeds, pests.
MAIT 8.01	0.31	NA	Eucalyp-tus	1990		✓✓		AR ✓✓✓	Older Eucalyptus stand - could be left as is. Matai reservoir catchment. Plan for assisted regeneration. Manage weeds, pests, wildings.
15 stands	**~ 72.19 ha**								
36 stands	**~ 180 ha in Maitai Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring**								

6. KEY OBSERVATIONS FOR THE MAITAI CATCHMENT AND FOREST BLOCKS

Refer maps following for stand identification (view larger maps here).

The majority of Maitai forestry estate is associated with Nelson city water supply or adjacent to the Maitai River along Maitai River Valley Road. The catchment has very high water and soil protection value and risks, as well as high biodiversity, recreational, amenity and tourism economic value. There are known risks from production forestry with the potential to impact the Maitai reservoir, river and estuary (primarily through sedimentation), roading and access to key water infrastructure.

All stands within the Maitai catchment should be transitioned away from clearfelling, prioritising soil and water protection, recreational and biodiversity outcomes from today - with particular emphasis on track and trail planning (easier grade trails and separated use trails where possible), and on planting native emergent and seed species, to support habitat enhancement for birdlife. Activity above the reservoir and water supply intakes should be managed to minimise sediment and other contaminants, including any potential impacts from increased recreational use or the establishment of a native forest timber park. Establishment and/or extension of wider riparian buffers is essential.

- All areas to be actively managed for pest and weed control.
- Take action to avoid pre-1990 land liability risk for ETS registered stands: 1.03 (now 1.05), 5.01, 3.01, 2.03, 7.02, 8.02.
- All stands of pinus radiata to be managed with a transitional forestry approach for active conversion to permanent forest tree cover
- Explore options for alternate funding for transition, including partnership with Tane Tree Trust
- Explore options for community participation in forest transition, especially recreational, trapping and conservation groups, and specialist timber interests.

CATCHMENT REVIEW - BROOK

The following pages show details of commercial forest in this catchment, based on NCC's Forestry Activity Management Plan 2021-2031, with added information and commentary based on Task Force members' personal observations, as well as other data acquired during the Task Force's review.

Four Task Force members were allocated a Catchment (Forest block) to review in-depth. These four catchment authors also collaborated on their research and findings, to ensure shared understanding of common issues (such as weeds and pests) and to produce a more meaningful catchment analysis and recommendations pertaining to all catchments. Reviews involved collecting, organising, analysing, and summarising a range of data and information related to physical elements (topography, current planted species, rainfall, aspect, soil characteristics, etc.) as well as the opportunities and risks presented by the current forestry situation(s).

Catchment reviews consist of a common framework that enabled the Task Force to:

- define an approach and collate key characteristics of the area
- identify risks & opportunities
- identify all commercial forest stands, and
- make observations or note key findings for their short and long-term future management.

Each Catchment review covered these types of comparisons/analysis:

- Maps related to the Catchment area
- Parameter setting – using the Task Force Aspiration Statement and its Values Overview of the Forest Area
- An Overview of the Forest Area
- Key Elements to Consider
- Scenario Assessment – considering a range of four options/alternatives to suit NCC's forested lands, as applied to each Catchment, being:
    - Continue plantation forestry beyond the current rotation
    - Transition to alternate timber species (exotic and indigenous)
    - Transition to mixed exotic & indigenous amenity forest
    - Transition to indigenous forest via natural regeneration or replanting
- Financial/Net Revenue from Production Forestry Considerations
- Catchment Stand-by-Stand Assessment – reviewing the stands of each Catchment across the four scenarios and providing additional information for each stand (stand identifier, area, value, species, and year planted)
- Key observations
- Areas for Action for the catchment and its forest stands
- Catchment opportunities

Aspiration Statement	"A resilient, continuous canopy, forested landscape, rich in biodiversity, that supports the many values of the people of Te Tauihu and our future generations"

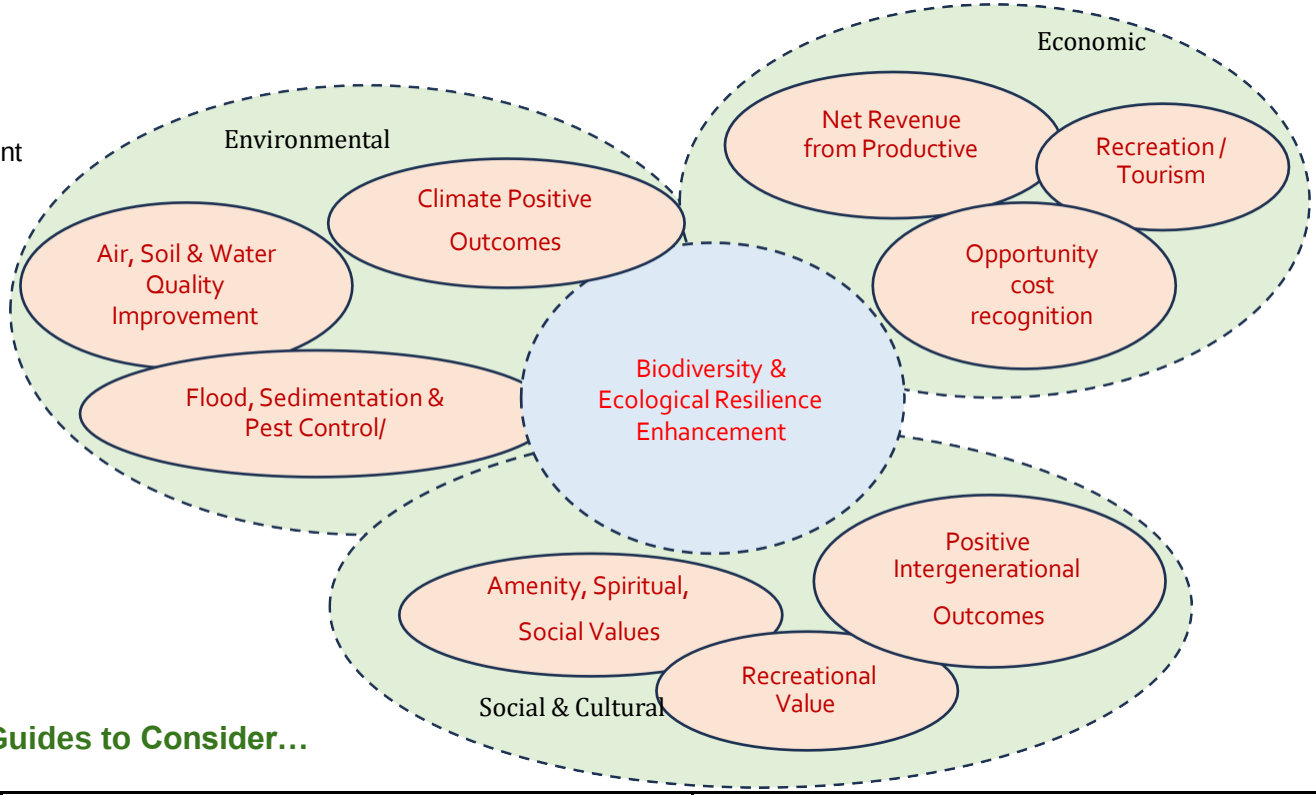
Values

Environmental
- Air, Soil, & Water Quality Improvement
- Flood, Sedimentation & Pest Control/Management
- Biodiversity Enhancement
- Climate Positive Outcomes

(resilience & permanent sequestration)

Social & Cultural
- Amenity & Spiritual
- Recreational
- Biodiversity Enhancement
- Positive Intergenerational Outcomes

Economic
- Net Revenue from Productive Uses (tangible & intangible)
- Opportunity Cost
- Recreation / Tourism
- Biodiversity enhancement



Risks, Opportunities, Parameters, Future Guides to Consider…

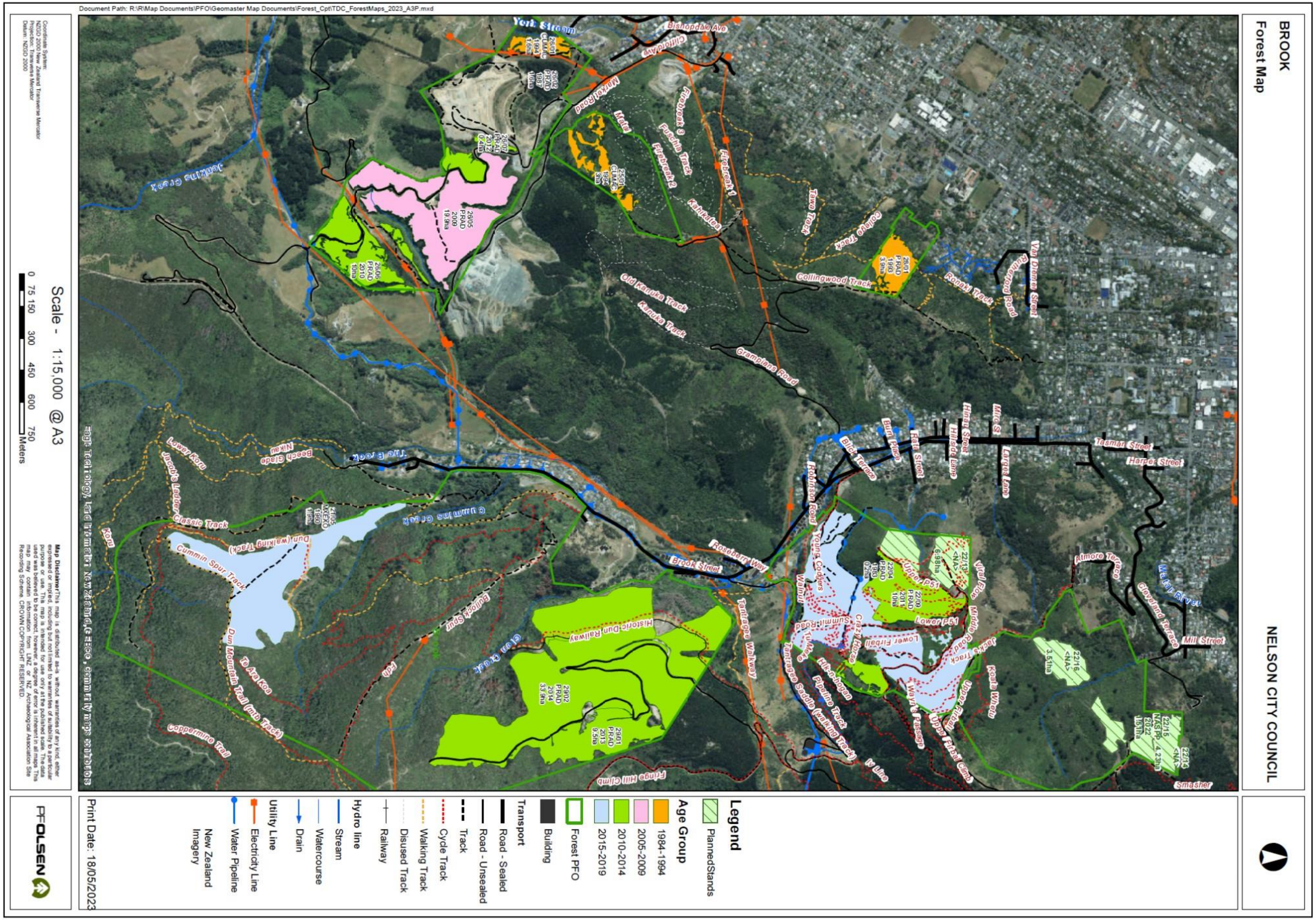
A. What are the Task Force's biggest challenges?
- Establishing a credible pathway to a more resilient forest model that meets a wide range of values
- Identifying potential 'roadblock' issues, such as:
  - Costs of transitions
  - Species mixes
  - Future uses
  - Perceptions of transition timeframes
  - Agreement on most effective societal/ institutional partnerships (shared leadership)

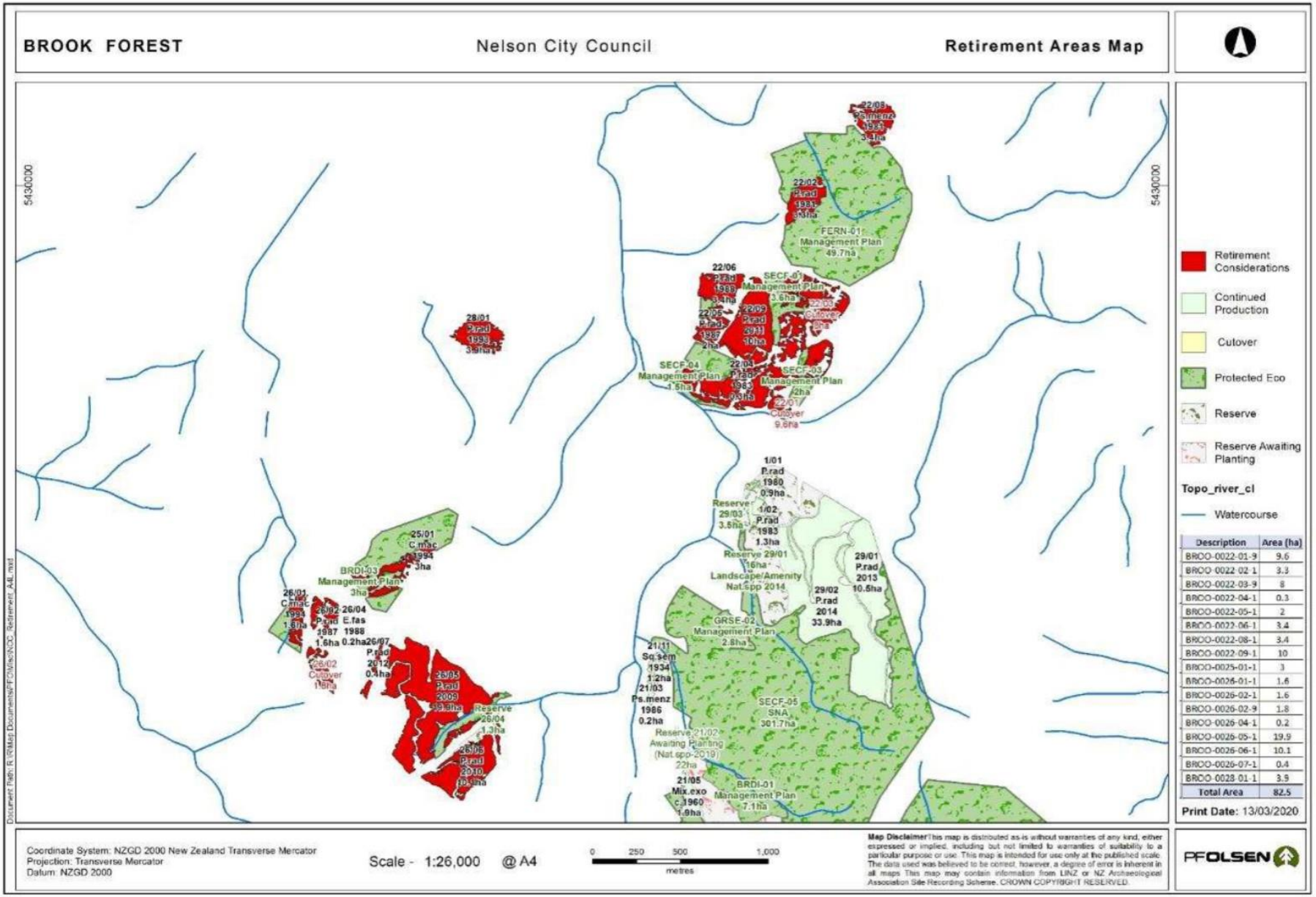
B. Mixed value of NCC commercial forests
- Financial returns (net)
- Financial and social values of all production costs (employment, track development and other infrastructure – costs of production)
- Biodiversity values
- Soil and water protection values
- Recreation values
- Climate change mitigation values
- Avoiding moral hazard

C. Innovative transformations
- Alternative revenue streams
- To perpetual community managed forests
- Governance structures that empower community/statutory organisations and partnerships and continuity of long-term goals and aspirations
- Forests with a wide range of species
- Forests that include some capacity for high value extraction of timbers while maintaining continuous canopies (think European models)

1. AN OVERVIEW OF THE FOREST AREA = BROOK / WAIMĀRAMA CATCHMENT (INCLUDES GRAMPIANS AND YORK VALLEY)

(view larger map here)





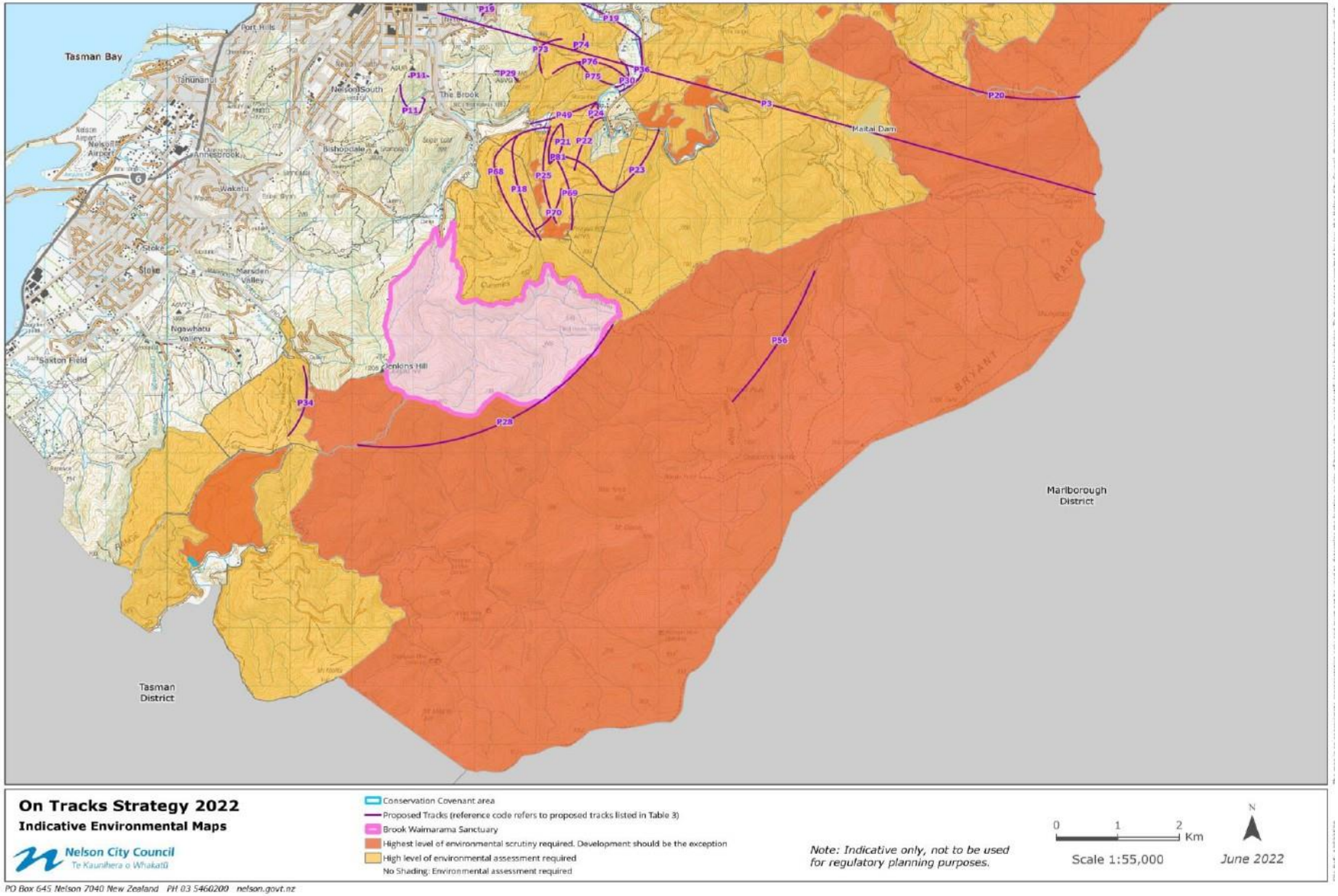
Incorporated from LandVision 2018 Report: NCC Forestry Alternative Land Management

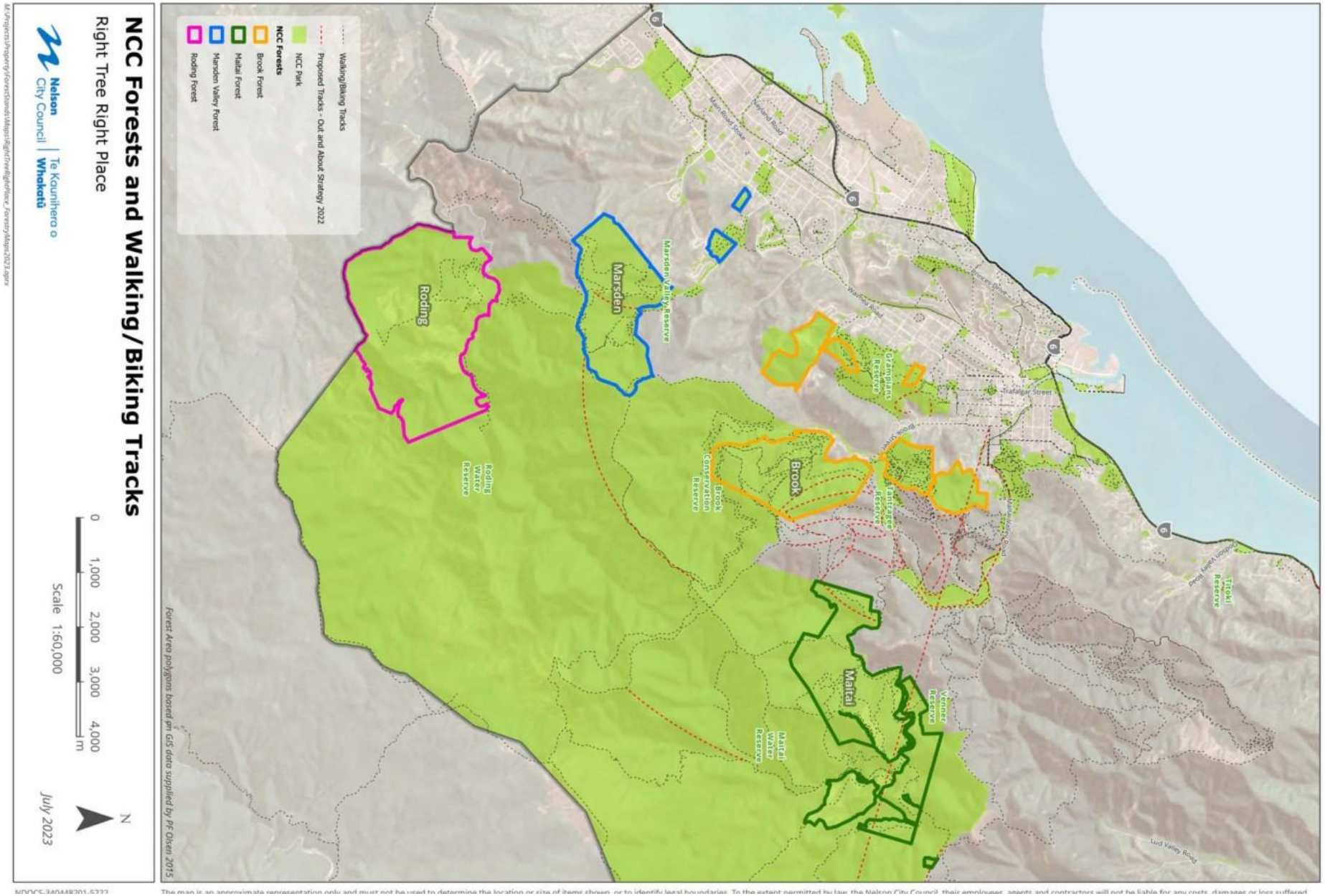
Out And About On Tracks Strategy 2022

(View strategy and large map, pg 27, here)

Recreational Trails Map

(view larger map here)

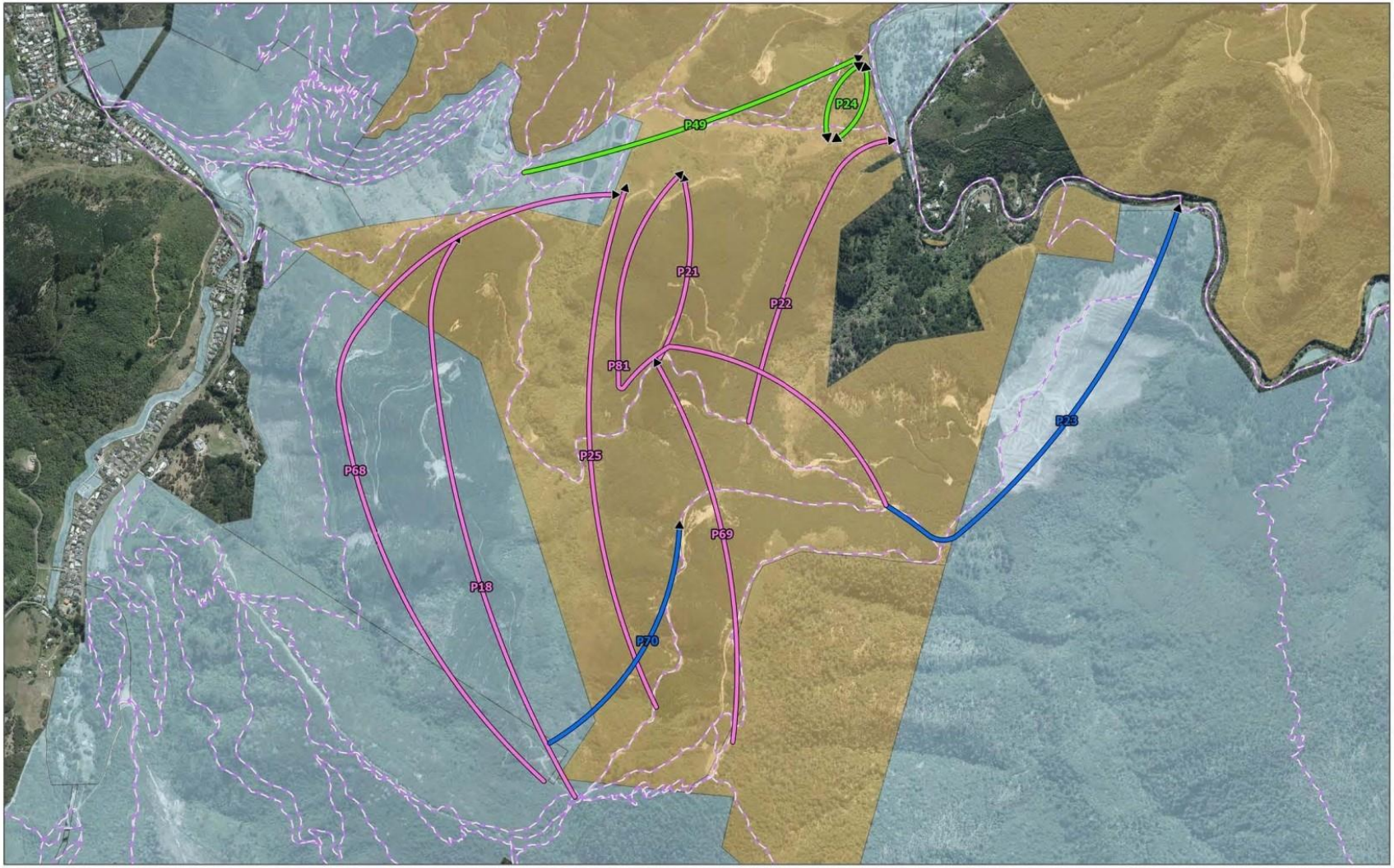




Brook Catchment Existing and Proposed Tracks[1]

(view larger map here)

[1] Out and About On Tracks Strategy 2022, pg 25



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Map 5 - Fringed Hill

OnTracks Strategy 2022

Nelson City Council
Te dun,hero o Wti.ikdhi

High Priority
Medium Priority
Low Priority
Existing Tracks

Conservation Department
Nelson City Council
Te Pataka a Ngati Koata Trust

Not : Propos«i tr c,k sha s havl! bttn sigmlic:,ntly g•n•nHz«J and should only be us•d for th• purpos• of dlr lon, not.tn•xact path

320 640 m

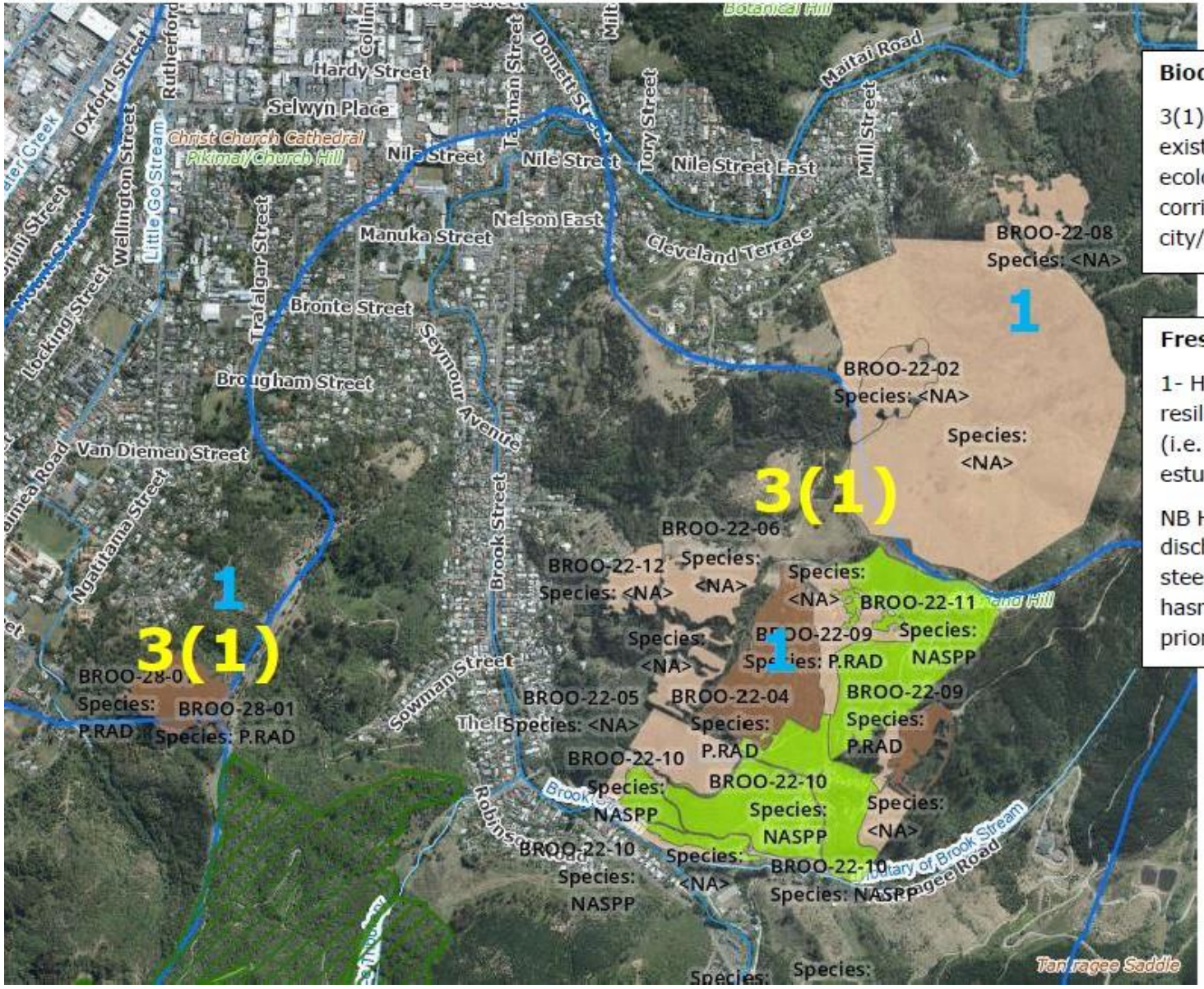
Scale 1:11,300

June 2022

POBox 645 Nelson 7040 New Zealdnd PH 03 5450200 nelson.govt.nz

NCC Environment & Science Team Guidance/Priorities (Brook North)
(view larger maps here)

Brook stands North – biodiversity and freshwater priorities



Biodiversity priority (yellow)

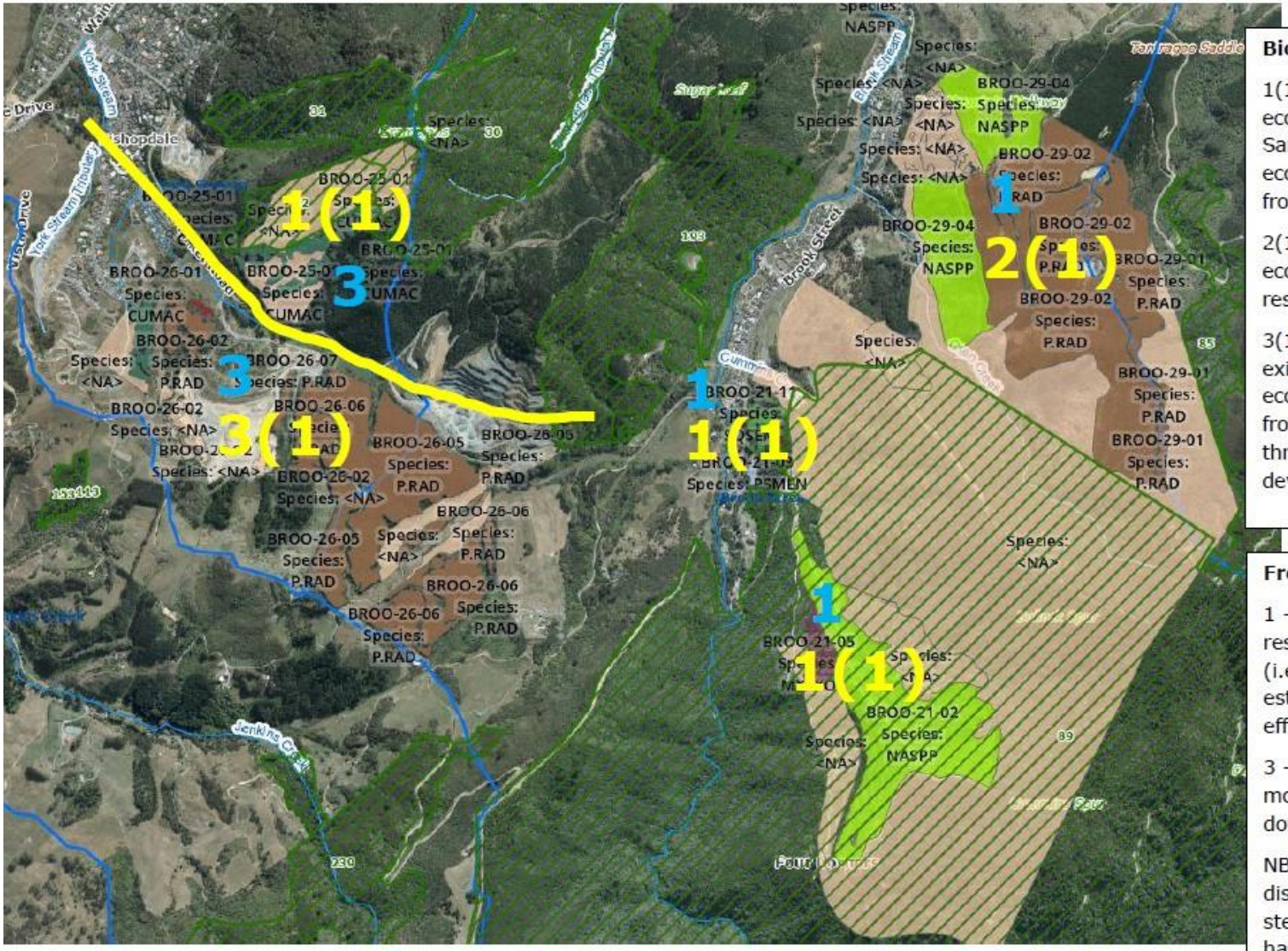
3(1) – Highly modified area with low existing values. Key area for restoring ecological connections & wildlife corridor from Brook Sanctuary/hills to city/coast.

Freshwater priority (blue)

1- High freshwater values and low resilience of receiving environment (i.e. short catchment, close to estuary).

NB High risk of erosion & sediment discharge at and after harvest on steep slopes – erosion susceptibility hasn't been factored into freshwater priorities.

Brook stands South – biodiversity and freshwater priorities



Biodiversity priority (yellow)

1(1) - Buffering of high value ecosystem (SNA and/or Brook Sanctuary). Key area for restoring ecological connections/wildlife corridor from Sanctuary/hills to city.

2(1) – Buffer for adjoining high value ecosystem (SNA). Good potential for restoration to extend buffer to SNA.

3(1) – Highly modified area with low existing values. Key area for restoring ecological connections/wildlife corridor from Brook Sanctuary/hills to coast through current & future urban development.

Freshwater priority (blue)

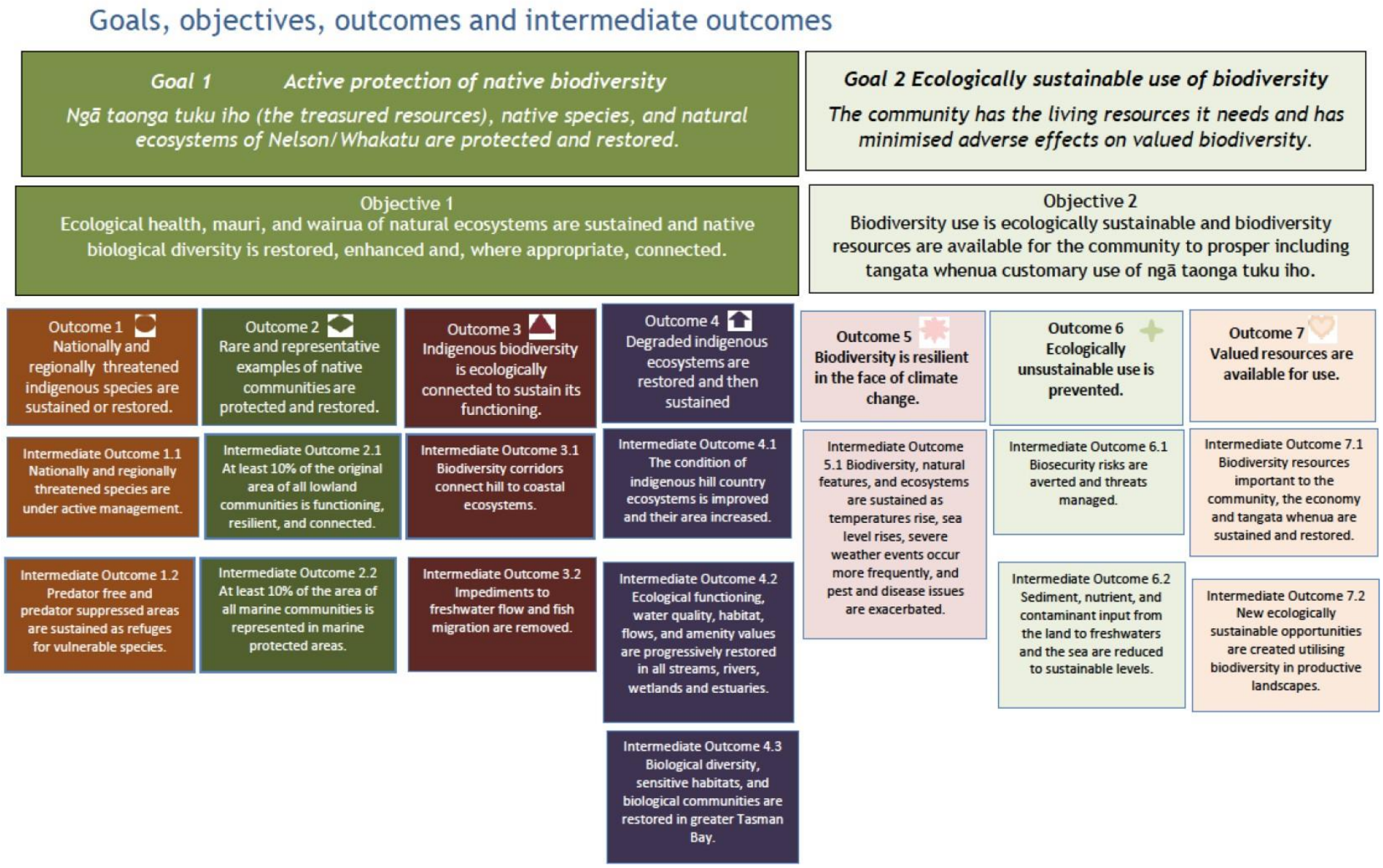
1 - High freshwater values and low resilience of receiving environment (i.e. short catchment, close to estuary, high risk of downstream effects).

3 - Low freshwater values and highly modified stream (catchment piped downstream).

NB High risk of erosion & sediment discharge at and after harvest on steep slopes – erosion susceptibility hasn't been factored into freshwater priorities.

Nelson Biodiversity Strategy 2018[2]

Figure 10 Nelson Biodiversity Strategy (2018) Goals, Objectives & Outcomes



[2] http://www.nelson.govt.nz/council/plans-strategies-policies/strategies-plans-policies-reports-and-studies-a-z/nelson-biodiversity-strategy-2/

1. AN OVERVIEW OF THE FOREST AREA - DESCRIPTION

NB. Footnote references include link to viewable copy of linked report when first referenced.

Background	Close proximity to the city centre, residential neighbourhoods (pop. 2,060 pax), schools, campground, community gardens, Riding for the Disabled, Brook Waimarama Sanctuary, SNAs. *Very* popular recreational area - biking and walking. Significant biodiversity corridor. All areas within Nelson Halo.[3] See Halo map.[4] Primary water treatment plant for the city, treating water from Maitai and Roding. Seven public reserves and a heritage precinct within Brook Valley. Narrow one way roads with logging trucks a safety concern.[5] All areas flagged for retirement/transition in PF Olsen 2020 map (previous page), except stands 29/01 and 29/02. A. Bell 2015 report, recommended all Brook stands be retired from production forestry when current crops were harvested: "Brook forest was found to have no stands that are suitable for ongoing plantations once the existing crop has been harvested. This is due to their being too close to existing infrastructure and residential zones and/or lack of suitable access."[6] "**Amenity** and/or unsuitable for commercial forestry – primary objective to provide recreational values for the local population – replant as native following harvest of current crop. Possibly lease for honey where appropriate and promote recreational values. If unable to be harvested safely, investigate poison thinning to allow undergrowth to develop gradually."[7]
History	Maori: Known as Waimārama (clear or transparent water). Valued for freshwater and mahinga kai. Colonial: Historical waterworks reserve and dam. Access to Dun Mountain Railway. Land acquired for securing water catchment.[8] Major flooding in 1970, with one resident swept away, was the catalyst for containing Brook Stream in a concrete channel. 2002, Brook Waimārama Sanctuary idea proposed and opened to public in 2007 - 700 hectare ecological island. August 2022 weather event - erosion/slips on recently cleared slopes caused significant damage and distress for homeowners. Management: Up until 2014-2015, Council's forestry was internally overseen by the Environmental Reserves Supervisor, along with 10,000+ ha of reserves. Management of the production forests contracted to PF Olsen.
Variety of landscape	Four main blocks and several outlying stands eg. Grampians (vicinity of Nelson College), and York Valley (landfill area). Varying ages (see map). Backs onto 1660 km² Mount Richmond Forest Park, and included the 690 ha Waterworks Reserve. Lower reaches had been initially cleared for grazing livestock and were regenerating. The beech forest in the upper reaches have been preserved as a water-supply reserve and are intact.[9] "Modelled mean annual rainfall across these forests is dryer than Maitai Forest, at approximately 1,000 mm. Stands on the flanks of Fringed Hill range in elevation from 100-600 m a.s.l and are exposed to winds from northern quarters. In comparison, the stands on Sharland Hill are of very different landform character, with mixed aspects including a considerable proportion of southern aspects

[3] http://www.nelson.govt.nz/environment/nelson-nature/natural-environment/the-nelson-halo/
[4] http://www.nelson.govt.nz/assets/Environment/Nelson-Nature/GIS-Nelson-Nature-Nelson-Halo-Operational-Area-15JAN2020.pdf
[5] https://en.wikipedia.org/wiki/The_Brook,_Nelson
[6] Bell, A. (2015). Nelson City Council – Review of plantations, 29 August 2015. Alan Bell and Associates. p.3. (linked here)
[7] Bell, A. (2015). Nelson City Council – Review of plantations, 29 August 2015. Alan Bell and Associates. p.15.
[8] https://www.brooksanctuary.org.nz/our-story-our-vision/the-longer-historic-detail
[9] https://en.wikipedia.org/wiki/Brook_Waimārama_Sanctuary

	with elevations of no greater than 350 m a.s.l. Face and gully areas have considerable topographic shelter and, overall, Sharland Hill provides a relatively sheltered and favourable site for native forest establishment."[10] "All areas of Brook Forest present important opportunities for native reforestation to boost native biodiversity on the fringes of Nelson city. The southernmost stand is directly adjacent to the Brook Waimārama Sanctuary which is also part of SNA 89. Significant Natural Areas are also located adjacent on Sugar Loaf, the Grampians, and Jenkins Hill."[11] "The Brook block contains a sizeable area within the York Valley (35.1ha) on land that has been set aside for landfill expansion, where the trees may not reach harvestable age, depending upon the rate of landfill expansion."[12] "The Brook blocks are in their second rotation."[13] "The potential for conflict has been further heightened by recent developments adjacent to existing production forests i.e. Brook Waimarama Sanctuary and residential subdivision development, and changes in the community's environmental awareness (e.g. landscapes and water quality)."[14] "Site rehabilitation costs can be substantial e.g. geotechnical work associated with the recent Brook Sanctuary stand harvest were in the order of $100,000 for engineering assessments, monitoring and sediment control measures. Given the above, it will be uneconomic to harvest certain stands, or uneconomic to retain certain stands in production forestry beyond the next harvest. The cashflow projections do not account for site reestablishment costs i.e. raking, spraying."[15] "Electricity transmission lines – two main electricity transmission lines pass through Nelson City Council's production forests: (1) part of the national grid which passes from Stoke, through the top of the York Valley, down the Brook Valley, behind Sharland Hill and then up through the Maitai Valley into Marlborough, and (2) a local line extending over the Barnicoat Range to the Roding water supply intake. The key issue with transmission lines is the fire risk posed by line strike (arcing) during strong winds, and damage to pylons during harvesting."[16] "Amenity landscapes are important to local communities for their visibility and the backdrop they provide to an area. Amenity landscapes are generally modified in some way, and their inclusion within regional/district plans is for the purposes of managing within limits the activities that occur within the amenity landscape unit. The recommended visual amenity landscapes called 'Barnicoat Range', 'Grampions', 'Sharland Hill' and 'Fringed Hill' overlap **most of the Marsden and Brook forest blocks.**"[17] "Since much of Nelson City Council's current crop of production forest trees were planted Nelson has experienced a significant increase in its urban footprint, with residential expansion occurring into the Marsden, York, Brook and Maitai valleys. This gives rise to two potential issues: (1) housing in close proximity to housing, and (2) increased heavy vehicle movements (logging trucks) in

[10] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.13. (linked here)
[11] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.13.
[12] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.7. (linked here)
[13] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.7.
[14] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.16.
[15] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.17.
[16] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.19.
[17] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.20.

	residential suburbs as part of harvesting operations.[18]" "The presence of residential development within close proximity/immediately adjacent to production forests is a major concern because of the potential fire threat, and the potential dangers created during harvesting. **This situation is most obvious in the Brook forest block** which has several stands where trees are located immediately uphill of residential areas. In stand 29/01 approximately 3ha of trees are located above a residential area. This stand already has many trees blown over by the wind. Such trees are dangerous for ground crews to deal with as the trees are all under tension, meaning the fallen trees can move or spring upright once the pressure is removed. Production forestry and residential development are incompatible land uses. As such, remaining trees and trees in stands located adjacent to residential areas cannot be recovered safely or economically, but they must be dealt with to address potential problems into the future i.e. uncontrolled windfall. Three options exist to address this option: (1) the trees are sprayed and left to break down in situ over a period of several years, (2) the trees are mechanically felled (using a specialised digger) and left in place to rot down, or (3) a combination approach where the trees are sprayed, and then after a period of several years they are mechanically felled and left to rot. Obviously, there is a cost to all of these options, in addition to the revenue lost by not recovering the trees. **Such areas should be permanently taken out of production forestry**."[19] "Brook forest contains approximately 126 ha of mostly radiata pine. The largest stand is expected to be harvested during 2015 but will not be replanted with exotics. Brook contains many small stands that are located close to city and suburban housing with associated challenges to carrying out normal production forest operations. **It is recommended that all stands in Brook revert to natural forest to avoid future problems**. This may involve harvesting of the existing crop or in some cases leaving the existing crop in situ. Brook stands have also suffered significant wind damage over the past 2-3 years. Stands in York Valley are associated with landfill and have also been affected by wind. The largest of the Brook stands are located in the Tantragee block. There are 11 ha planted in 2013 and 34 ha planted in 2014 following harvesting by the previous owner. The purchase of this block does not appear to have been appraised in terms of suitability for forestry. Ownership of this block appears to be extending further the issues of forestry adjacent to housing development. Normal forest investors would not put money into such blocks."[20] "The national wilding pine calculator indicates the wilding pine risk for Nelson City Council's production forests is very high for Douglas fir and high for Pinus radiata at identified take-off points. The current and potential future impact of wilding pines on biodiversity values (and Nelson Nature's objectives) are such that Nelson City Council should destroy all of its current Douglas fir stands (a total of 39 hectares) as soon as possible, and that prominent Barnicoat Range ridgeline should not be replanted in conifer species, and instead be replanted in native vegetation."[21] "Brook Waimarama Sanctuary – whilst this initiative has been in the planning stage for many years, it is only in the last year that predator-proof fencing has been erected to create a mainland island at the site. In anticipation of the fencing being erected, the production forest stand located immediately upslope of the proposed fence line was harvested. Future use of this stand for production forestry purposes is impractical given the lack of an economically viable access route for removing harvested timber. As such, this stand should be put to some other use – the most compatible being conversion to native vegetation (which is also consistent with the aims of Nelson Nature)."

[18] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.21.
[19] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.21.
[20] Bell, A. (2015). Nelson City Council – Review of plantations, 29 August 2015. Alan Bell and Associates. p.5.
[21] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.24.

	"Residential areas/Brook Waimarama Sanctuary – production forestry is incompatible with these neighbouring land uses due to the risks associated with tree fall (during storms and harvesting) and fire. All stands within proximity to these areas should be harvested where safe and economic to do so, or poisoned/felled if not, within the next 2-5 years."[22] "Some experience has been gained by NCC with native forestry in Brook Forest. Specifically, native tree plantings have been undertaken on plantation clear-fells at Codgers (Fig. 10) and on parts of the southernmost block adjacent to the Brook Waimārama Sanctuary (Figs. 11 & 12). Codgers plantings are high-density native forest restoration plantings which focus on improving amenity and biodiversity values. The plantings were visited in July 2020 and again in February 2022 (see Fig. 10). Planted kānuka had grown approximately 1.5 m in height attaining high levels of canopy cover over this 18-month period. Lowland tōtara had also exhibited good survival and growth performance over this period. Plant pests are prolific in and around the Brook Forest. Native forestry options would require ongoing plant pest control focusing on both structurally dominant and shade-tolerant species. Browsing mammals are also a considerable problem and mature forests of the area feature heavily browsed understories and understorey species composition is limited to only unpalatable species."[23] A. Bell report recommendations by stand for Brook Forest: "Brook Forest. 21.04 – 20.0 ha 1986 Rad harvest in 2015, revert to native. 22.05 – 1.6 ha 1987 Rad harvest in 2016, revert to native. 22.06 – 3.5 ha 1988 Rad harvest in 2016, revert to native. 22.09 – 11.0 ha of 2011 Rad harvest in 2038, revert to native. 22.02 – 3.0 ha of 1981 Rad with no access, leave as protection forest. 22.08 – 3.4 ha of 1981 D fir, harvest in 2026, revert to native. 22.03 – 5.8 ha of 1983 D fir, fell in 2028, revert to native. 25.01 – 2.5 ha of 1994 macrocarpa, wind damaged, leave as protection forest. 26.01 – 1.9 ha of 1994 macrocarpa, buffer for landfill, leave as protection forest. 26.02 – 0.5? ha remnant Rad, leave as protection forest. 26.05 – 15 ha (approx.) of 2009 Rad, wind damaged, harvest in 2036, or when needed for landfill. 26.06 – 10 ha 2010 Rad, wind damaged, harvest in 2037 or when needed for landfill. 26.07 – 0.4 ha 2012 Rad, harvest in 2039 or when needed for landfill. 28.01 – above College 3.0 ha 1993 Rad, fell in 2021, revert to native. 29.01 – 10.7 ha 2013 Rad, fell in 2040, revert to native. 29.02 – 34.2 ha 2014 Rad, fell in 2041, revert to native. 29.03? Tantragee remnant, mature trees left behind by previous owner on very dangerous site above houses. Clear for safety reason but will be expensive operation. Replant to native."[24] "Most of the currently plantation forested sites in the NCC estate would sustain a natural tree cover of Hard Beech with very scattered and low densities of rimu and other podocarps. Red beech would prevail in damper gullies."[25]

[22] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.26.
[23] Forbes, A. (2022). A Review of Native Forestry Options for Nelson City Council's Forestry Estate. Forbes Ecology. p.13.
[24] Bell, A. (2015). Nelson City Council – Review of plantations, 29 August 2015. Alan Bell and Associates. p.17.
[25] PF Olsen. (2020). Forest Management Plan FSCGS04. p.51.(linked here)

2. KEY ELEMENTS TO CONSIDER

Key Element for this Forest	Describe Current Situation	Risks? (& their likelihood)	Opportunities? (& their likelihood)
Water catchment	• Brook Stream water catchment • Water treatment plant at Tantragee Saddle	• Sedimentation risks impact Maitai River and estuary. Med. • Fire risk to treatment plant. Med.	• Improve water health and biodiversity. High.
Slopes/flats – topographical details – challenges – by compartment	• Small scattered stands. Moderately steep. • High fire risk.[26]	• Erosion and harvest risk with proximity to housing and recreational users. Med.	• Suitable for indigenous reforestation. Blocks already transitioned doing moderately well.
Tourism	• Very high value for mountain-biking • Very high biodiversity value with Brook Waimārama Sanctuary	• Mountain biking reputation & earnings impacted by forest closures. High likelihood.	• Permanent recreational trails and enhanced biodiversity corridor
Recreation	• High value for walking, running, mountain-biking, enjoying nature	• Forest closures due to harvesting and fire risk. Med-high.	• Permanent recreational trails and enhanced biodiversity corridor
Cultural/amenity aspects	• High amenity values - seven scenic reserves in valley • Waimārama Community Gardens	• Opportunities to enhance amenity not realised. Med-high. • Loss of social licence to continue clearfell harvesting. High.	• Develop multi-catchment transition forests plan so all communities understand the goal and the path to achieving this. High.
Harvest history – revenue, costs, known challenges	• Uneconomical to continue in production forestry. • Challenges with steepness of slopes and proximity to housing.	• Loss/cost to harvest/remove. Med-high. • Slips/erosion post harvest. Med-high.	• Adopt active transition forest methodology. Realise opportunities for external funding - voluntary carbon and biodiversity credits. Funding for indigenous reforestation. Med.
Pests – (plant & animal)	• Vine weeds; ungulates; wilding pines	• Pests not managed. Financial and biodiversity costs. Med.	• Program of vine weed & ungulate control underway. Wilding pine control underway. High.
Biodiversity	• High biodiversity value with Brook Waimārama Sanctuary, Nelson Halo, Richmond Ranges	• Biodiversity outcomes not realised. Med.	• Biodiversity outcomes significantly improved with reintroduction of endangered species. Birdlife spills out into neighbouring valleys and city centre. Med-high.

[26] PF Olsen. (2020). Forest Management Plan FSCGS04. p.93.

3. SCENARIO ASSESSMENT

Forest Area assessed against these Values criteria. Note the scoring, 1-5, with 1 being low value/poor outcome, and 5 being high value/beneficial outcome.

	Transition / Continuation								
Value ➔ & Scenario ⬇ 1=low / 5=high	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (X out of 40)**
Plantation Pine (clearfell management)	- Known costs. - Net revenue variable. - Weed, animal and wilding pine control costs need to be attributed to forestry account (will increase costs, decrease net return). - Riparian buffers need to be enhanced (will increase costs, decrease net returns).	- Loss of social licence. - Fire risk. - Log price volatility. - Conflict with recreational users. - Ongoing negative impact on broader regional economic outcomes (recreational tourism). - Increased erosion, slip, sediment risk at harvest.	- Low returns expected. Refer Financial Considerations following. - Management costs high and complex. Refer Management Considerations, following. - Carbon footprint of management and log exports.[27]	- Negatively impacts these values/ outcomes. - Community concern about logging trucks in narrow residential streets, around daycare and schools.	- Can support recreational outcomes, but significant negative impacts when access lost due to harvest, fire risk. - Negatively impacts tourism economic outcomes[28]. - Visual impact reflects poorly on the city's image and amenity.	- Pine forests don't provide food for native species. - Frequent habit disturbance with harvesting activities. - Less diversity of species in monoculture plantations.	- Moderately beneficial unless harvesting and in years after harvest. - Pine pollen seen as pollutant and irritant for some. - Nutrient removal in harvest; soil compaction due to heavy equipment.	- Flood control beneficial unless in 1-8 years after harvest. - Pest plants not well managed in NCC production forests. Vector for infecting adjacent native forests (SNA). - Sedimentation of waterways and marine environment concerning.	
Score / Total	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**2**	**13 / 40**
Alternative continuous cover species (native and/or exotic)	- Planting costs higher than pine - but for longer term investment. - Revenue higher per m3. - Weed and pest control costs may offset by non-timber returns (grants, co-funding).	- Weed and pest control (esp. gorse), wilding pine removal. - Fire risk during establishment. - Planting failure (can be mitigated).	- Higher value timber revenue realised over longer term. - Non-timber revenue sources possible (honey lease etc). - Voluntary carbon and biodiversity market potential.	- Positively impacts these values/ outcomes. - Community support for transition away from clearfell forestry likely.	- Regional economic return from recreational use (mountain biking, MTB) is significant. - Permanent forests preferred. - Enhanced outcomes.	- Significantly less habit disturbance. - Tree species can enhance outcomes.	- Long term enhanced outcomes.	- Enhanced outcomes due to less soil disturbance. - Active weed and pest management preferable. - Plantings also act as riparian buffers.	

[27] Miner, R. (2010). Impact of the global forest industry on atmospheric greenhouse gases. Food and Agriculture Organization of the United Nations. (linked here)
Also, IPCC AR6 chapter (2023). https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_07.pdf

[28] McIndoe C., Rahman M., and Dixon H. (Sep 2023). Mountain biking – the economic opportunity and risk for Nelson Tasman. BERL. p.5. (linked here)

Score / Total	3	3	4	4	4	4	4	4	30 / 40
	Transition / Continuation								
Value ➔ & Scenario ⬇	Cost or Affordability	Risks	Net Revenue	Amenity, Spiritual, Social	Tourism & Recreation	Biodiversity Enhancement	Air, Soil & Water Quality Improvement	Flood, Sedimentation & Pest Control	Scenario Score (x out of 40)
Mixed native & exotic amenity forest	- Planting costs higher than pine - but for permanent forest investment. - Weed and pest control costs may offset by grants, co-funding, non-timber returns (eg. honey lease etc).	- Weed and pest control (esp. gorse), wilding pine removal. - Fire risk during establishment. - Planting failure (can be mitigated).	- Non-timber income sources: lease for honey; recreational user access permits; external grant and co-funding.[29] - Voluntary carbon and biodiversity market potential.	- Positively impacts these values/ outcomes. - Refer[30]. - Nature immersion and connection. - Community building and involvement. - Community support for permanent afforestation.	- Significant economic impact (mountain biking) .~$55m per annum, 388 FTE. Projected growth to $89m pa, and 625 FTE, when access is not restricted.[31] - Permanent forests preferred. - Also, walking, running, orienteering, national cycle trail.	- Permanent forests support significantly less habit disturbance. - Tree species can enhance outcomes.	- Permanent forests preferred. - Enhanced outcomes. - Very long term carbon sequestration.	- Re-establishing canopy key to mitigating risk on steep slopes. Faster growing exotics could be nursery for slower natives. - Enhanced outcomes due to less soil disturbance. - Active weed and pest management preferable.	
Score / Total	3	3	3	5	5	4	5	5	33 / 40
Native forest via natural regen (NR) and/or active planting (AP)	- Lower transition costs with passive regeneration, focusing spend on weed and pest control. - Planting costs higher, but for permanent forest investment. - Weed and pest control costs may offset by grants, co-funding, non-timber returns (eg. honey lease etc).	- Weed and pest control (esp. gorse), wilding pine removal. - Fire risk during establishment. - Planting failure (may be mitigated). - Longer transition window to establishment.	- Voluntary carbon and biodiversity market potential. - Other income sources: lease for honey; recreational user access permits; external co-funding. - (NR) most economical option.	- Positively impacts values/ outcomes. - Kaitiakitanga value enhanced. - Nature immersion and connection. - Community building and involvement. - Community support for permanent afforestation. - (NR) Gains realised more slowly	- Economic benefit as above. - Enhanced outcomes. - Walking, mountain biking, running, orienteering, national cycle trail, nature immersion / connection.	- Significantly less habit disturbance. - Species can enhance indigenous biodiversity outcomes. - Refer[32].	- Permanent forests preferred. - Enhanced outcomes. - Very long term carbon sequestration. - (NR) Gains realised more slowly.	- Enhanced outcomes due to less soil disturbance. - Active pest management preferable. - Community pest and weed control possible in accessible areas. - (NR) Erosion risks mitigated more slowly.	
Score / Total	3	3	3	5	4	5	5	4	32 / 40

[29] Excellent example: https://www.rnz.co.nz/national/programmes/countrylife/audio/2018899442/the-whanganui-forest-which-never-stopped-growing-opportunity

[30] https://www.c40knowledgehub.org/s/article/Why-biodiversity-matters-for-cities-and-the-climate

[31] McIndoe C., Rahman M., and Dixon H. (Sep 2023). Mountain biking – the economic opportunity and risk for Nelson Tasman. BERL. p.14-15.

[32] https://www.nfrt.org.nz/the-facts/

4. FINANCIAL / NET REVENUE FROM PRODUCTION FORESTRY CONSIDERATIONS

Per PF Olsen forest management plan, key stands of interest being considered for continuation in production forestry are Broo 29-01 and 29-02.
Per stumpage summary below,[33] stumpage value has been estimated at $36,440/ha:

- Broo 29-01, 9.5ha, estimate $346k return on 28 yr cycle. Value = $12,357ha/pa realised after 28 yrs. Value = $1,300ha/pa (over 28 years)
- Broo 29-02, 33.9ha, $1.235m return on 28 yr cycle. Value = $44,107ha/pa realised after 28 yrs. Value = $1,301ha/pa (over 28 yrs)

However, stands with a similar/higher valuation, in Maitai catchment (eg. Mait 4-05, 13.1ha, 2021 stumpage valuation $44,011ha), have only realised a 2022 harvest net return of $13,333ha, 30% of book valuation.[34] The inference is that the realised return on these Brook forests could be significantly less than projected stumpage valuation.

Appendix 3: Stumpage Summary by Stand

Forest	Stand	Planted Year	Yield Table	NSA (ha)	Age of Clearfell	Stumpage Value ($/ha)
BROO	0022-04	1983	29825CF-LVL_S25	0.3	45	21,507
BROO	0022-09	2011	MAIT-F600-LVL_S25	10.0	28	27,448
BROO	0026-01	1994	MAC	1.6	35	17,250
BROO	0026-02	1987	29830CF-LVL_S25	1.7	45	68,233
BROO	0026-05	2009	MAIT-F600-LVL_S25	19.9	28	36,440
BROO	0026-06	2010	MAIT-F600-LVL_S25	10.1	27	34,056
BROO	0026-07	2012	MAIT-F700-LVL_S25	0.5	25	21,617
BROO	0028-01	1993	42043CF-LVL_S25	3.9	33	-25,839
BROO	0029-01	2013	MAIT-F600-LVL_S25	9.5	28	36,440
BROO	0029-02	2014	MAIT-F600-LVL_S25	33.9	28	36,440

Appendix 5: Tree crop market value by stand

Forest	Stand	Planted Year	Yield table	NSA (ha)	Age in 2023	Tree crop market value ($/ha)	Total ($)
BROO	0022-04	1983	29825CF-LVL_S25	0.3	40	13,079	3,270
BROO	0022-09	2011	MAIT-F600-LVL_S25	10.0	12	4,457	44,753
BROO	0026-01	1994	MAC	1.6	29	8,979	14,456
BROO	0026-02	1987	29830CF-LVL_S25	1.7	36	31,756	52,398
BROO	0026-05	2009	MAIT-F600-LVL_S25	19.9	14	9,103	181,337
BROO	0026-06	2010	MAIT-F600-LVL_S25	10.1	13	8,294	83,351
BROO	0026-07	2012	MAIT-F700-LVL_S25	0.5	11	4,046	1,821
BROO	0028-01	1993	42043CF-LVL_S25	3.9	30	0	0
BROO	0029-01	2013	MAIT-F600-LVL_S25	9.5	10	4,198	39,840
BROO	0029-02	2014	MAIT-F600-LVL_S25	33.9	9	3,431	116,346

NB. In economics, a *moral hazard* is a situation where an economic actor has an incentive to increase its exposure to risk because it does not bear the full costs of that risk. There is a moral hazard consideration here with Council's forestry, where a closed forestry account and production forestry operation is not liable for: costs associated with erosion/slips (slips on to homes in Brook Valley and severing of water mains and cycle trail in Maitai Valley, in Aug 2022 weather event) >> cost falls to ratepayers; costs associated with pest weed and animal control charged to Parks & Reserves where undertaken >> cost falls to ratepayers; closures of very high value recreational areas that contribute millions to Nelson's GDP pa, due to harvesting, fire risk >> cost falls to wider community.

Management Considerations, per A. Bell 2015 report:
"**12. Avoiding conflicts of interest in current management**.

- The current management setup is that PFO carry out all forestry functions including harvesting, marketing, replanting, tending, annual budgeting, financial reporting, forest inventory, forest valuation, casual management requests as well as any one-off reviews such as the Economic Evaluation of Potential Harvest Areas (26 January 2015).
- There are no independent checks on the harvesting and marketing operation.
- A further method that could be employed to ensure that harvesting is giving maximum benefit back to NCC would be to make all significant harvesting operations "contestable" ie. call for tenders/proposals for certain stands or groups of stands ready for harvest. An obvious project for tender is the 150 ha (approx.) of radiata that will be harvestable at Roding over the next 6-7 years.
- There are a number of reputable harvesting and marketing companies in the Nelson area and there is plenty of competition for this work."[35]

Refer: 13. Management Structures of other Councils and small owners - for examples of other management structures and efficiencies. Pgs 20-23

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[33] PF Olsen. (2023). NCC Tree Crop Valuation. p.38, 40. (linked here)
[34] Stuart Orsman.(2023). Tree Crop Market Value by Stand Reconciliation. Table 1. Row 37. Columns AF-AK.
[35] Bell, A. (2015). Nelson City Council – Review of plantations, 29 August 2015. Alan Bell and Associates. p.20.

5. BROOK CATCHMENT STAND-BY-STAND ASSESSMENT

For stand reference maps refer here.
NOTE: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)					**Assessment against scenarios (all of which produce tall canopy forests)**				
Stand Number	Area (ha)	Value ($) / ha	Species	Year planted / estab-lished	**1) Plantation forestry** (pinus radiata) **Scenario (1A**) Transition post mature harvest **Scenario (1B)** Active transition pre maturity	**2) Alternative continuous cover timber species** (native and/or exotic)	**3) Mixed native and exotic amenity forest tree cover**	**(4) Native forest tree cover** via: **(P)** planting, or **(AR)** assisted regeneration, or **(PR)** passive regeneration	**Comments** NB. Refer appendix for further detail on specific values for each stand, species and year harvested. Code: PFO = PF Olsen UMo = Under management of Wildings = wilding pines
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇									
BROO 22.05	2.03	NA	Was P radiata	1987			✓✓	P ✓✓✓ AR ✓✓✓	Harvested 2021. UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 22.06	3.38	NA	P radiata	1988				P ✓✓✓ AR ✓✓✓	Harvested 2021. UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 22.08	3.37	NA	Was D fir	1981			✓✓	P ✓✓✓ AR ✓✓✓	Harvested 2021. UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 22.12	1.9	NA	Was P radiata	1988			✓✓	P ✓✓✓ AR ✓✓✓	Harvested 2021. UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration. (prev. mapped as BROO 22.06)
BROO 25.01	2.98	NA	Macro-carpa	1994	1B ✓✓✓			AR ✓✓✓	Macrocarpa, 29 yrs. Within Grampians Reserve native forest. Harvest / poison / fell macrocarpa. Manage weeds, pests, wildings. assisted regeneration eg. seed trees planting.

BROO 28.01	3.87	-$25,839	P radiata	1993	1B ✓✓✓		✓✓	AP ✓✓✓	Pinus radiata, 20 yrs. Grampians block above Nelson College. Harvest / poison / fell / thin pine as soon as practicable. Plan for planting and assisted regeneration. Manage weeds, pests, wildings.
6 stands	**17.53 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇									
BROO 22.04	.25	$21,507	P radiata	1983	1B ✓✓✓		✓✓	P ✓✓✓ AR ✓✓✓	40-yr old pine. PFO planned to harvest with 22.09 in 2039. Suggest active transition prior. Harvest / poison / fell / thin pine. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 22.09	10.04	$27,448	P radiata	2011	1B ✓✓✓		✓✓	AP ✓✓✓ AR ✓✓✓	Due for mature harvest 2039. Prioritise for recreational use from today. Plan for: transitional forestry, building MTB trails of easier grade. Harvest / poison / fell / thin pine. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 29.01	9.49	$36,440	P radiata	2013	1B ✓✓✓		✓✓	AP ✓✓✓ AR ✓✓✓	Due for mature harvest 2040. Prioritise for recreational use from today. Plan for: transitional forestry, building MTB trails of easier grade. Harvest / poison / fell / thin pine. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 29.02	33.91	$36,440	P radiata	2014	1B ✓✓✓		✓✓	AP ✓✓✓ AR ✓✓✓	Due for mature harvest 2040. Prioritise for recreational use from today. Plan for: transitional forestry, building MTB trails of easier grade. Harvest / poison / fell / thin pine. Manage weeds, pests, wildings. Planting and assisted regeneration. NB. Active slip below, avoid large clearfells.
4 stands	**53.69 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇									
BROO 26.01	1.61	$17,250	Macro-carpa	1994	1B ✓✓		✓✓	AP ✓✓✓	Buffer between residential and landfill. Landfill needs / preferences important.

									Replant for amenity/permanent forests when/if harvested. Suggest amenity planting prior. Could thin to encourage reforestation.
BROO 26.02	3.45	$68,233	P radiata	1987	1B ✓✓		✓✓	AP ✓✓✓	Buffer between residential and landfill. Landfill needs / preferences important. Replant for amenity/permanent forests when/if harvested. Suggest amenity planting prior. Could thin to encourage reforestation.
BROO 26.04	.23	NA	Eucalypt	1998			✓✓✓	AR ✓✓	Eucalyptus, 35 yrs. Retain for amenity. Buffer between residential and landfill. Landfill needs / preferences important. Replant for amenity/permanent forests when/if harvested. Suggest amenity enrichment planting prior.
BROO 26.05	19.92	$36,440	P radiata	2009			✓✓	AP ✓✓✓	Landfill needs / preferences are priority here. Replant for amenity/permanent forests where possible when/if harvested.
BROO 26.06	10.05	$34,056	P radiata	2010			✓✓	AP ✓✓✓	Landfill needs / preferences are priority here. Replant for amenity/permanent forests where possible when/if harvested. Could thin to encourage reforestation. Consider enrichment planting prior.
BROO 26.07	.45	$21,617	P radiata	2012			✓✓	AP ✓✓✓	Landfill needs / preferences are priority here. Replant for amenity/permanent forests where possible when/if harvested.
6 stands	**35.71 ha**								
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇									
BROO 21.02 (was 21.04 and part of 21.05)	22.02	NA	Native (was P radiata)	2019 & 2020 (P radiata harvested 2016)				AR ✓✓✓	UMo Parks & Reserves. Strong gorse growth. Wilding pines. Kanuka doing well in the '19 plantings (top half) but are patchy in the '20 plantings (bottom half). May have a pre-1990 land liability accruing. Consider planting tall canopy species and seed sources. Manage weeds, pests, wildings.

BROO 21.03	0.23	NA	Douglas Fir	1986			✓✓✓	PR ✓✓✓	UMo Parks & Reserves. Douglas Fir stand, unharvested. Retired as amenity forest. Manage weeds, pests, wildings. Support passive regeneration.
BROO 21.05	1.93	NA	Mixed	1960			✓✓✓	PR ✓✓✓	UMo Parks & Reserves. Mixed species. Amenity forest. Poison/fell/remove where unsafe near walking track. Manage weeds, pests, wildings. Support regeneration.
BROO 21.11	1.22	NA	Redwood	1934			✓✓✓	PR ✓✓	UMo Parks & Reserves. Redwood, planted 1934. Permanent forest for amenity. Manage weeds, pests, wildings. Support passive regeneration.
BROO 22.02	3.3	NA	Was P radiata	1981				P ✓✓✓ AR ✓✓✓	UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration.
BROO 22.10	14.74	NA	Was P radiata	NA				P ✓✓✓ AR ✓✓✓	UMo Parks & Reserves. Manage weeds, pests, wildings. Support assisted regeneration and planting (small area), eg. seed trees planting. (prev. mapped as 22.01)
BROO 22.11	5.8	NA	Douglas fir	1983				P ✓✓✓ AR ✓✓✓	UMo Parks & Reserves. Manage weeds, pests, wildings. Planting and assisted regeneration. Consider harvest / poison / fell / thin douglas fir if wilding risk concerns. Could thin to encourage reforestation. (prev. mapped as 22.03)
BROO 29.04	15.97	NA	Was P radiata, now native species	2014				AR ✓✓✓	UMo Parks & Reserves. Steep areas of 29.01 and 29.02 removed from production after last harvest and replanted in native species. Known landslide risks. Manage weeds, pests, wildings. Planting and assisted regeneration.
8 stands	**65.21 ha**								
24 stands	**~172.14 ha in Brook Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring**								

6. KEY OBSERVATIONS FOR THE BROOK CATCHMENT AND FOREST STANDS

The entire Brook forestry estate is urban fringe. The catchment has very high biodiversity, recreational, amenity and tourism economic value - currently approx $50m per annum economic impact with $30-40m per annum unrealised potential.[36] There are known risks from production forestry with the potential to impact homes, schools, roading and access to key water infrastructure. All stands within the Brook catchment should be transitioned away from clearfelling, prioritising recreational and biodiversity outcomes from today - with particular emphasis on track and trail planning (easier grade trails and separated use trails where possible), and on planting native emergent and seed species, to support habitat enhancement for birdlife from the Brook Waimarama Sanctuary.

- All areas to be actively managed for pest and weed control, including wilding pines which are already an issue in some transitioned areas.
- Take action to avoid pre-1990 land liability risk: BROO 22.02
- Stands of pinus radiata to be managed with a transitional forestry approach for active conversion within 10 years to permanent forest tree cover, prioritising recreational access, biodiversity outcomes, nature-based resilience: BROO 22.04, 22.09, 29.01, 29.02
- No stands eligible for post-1989 ETS credits, but explore options for alternative revenue sources to support transition and ongoing forest estate management eg. honey production leases, voluntary carbon and biodiversity credits, external grant and co-funding.
- Explore options for community participation in forest transition, especially recreational, trapping and conservation groups; possibility for ‘global forest’ for former refugee and migrant communities involved in planning, design, species selection, planting and maintenance eg. BROO 28.01 or another suitable and accessible area.

Refer maps following for stand identification (view larger maps here).

[36] BERL. Sep 2023. Mountain biking – the economic opportunity and risk for Nelson Tasman. Prepared for Nelson Regional Development Agency. (linked here)

NCCForest
Compartment-Stand
21-0l
21-(1l

NCC Forest u-10
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NCC Forest Stands - Brook Forest Map North

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NCC Forest Stands - Brook Forest Map South

Right Tree Right Place

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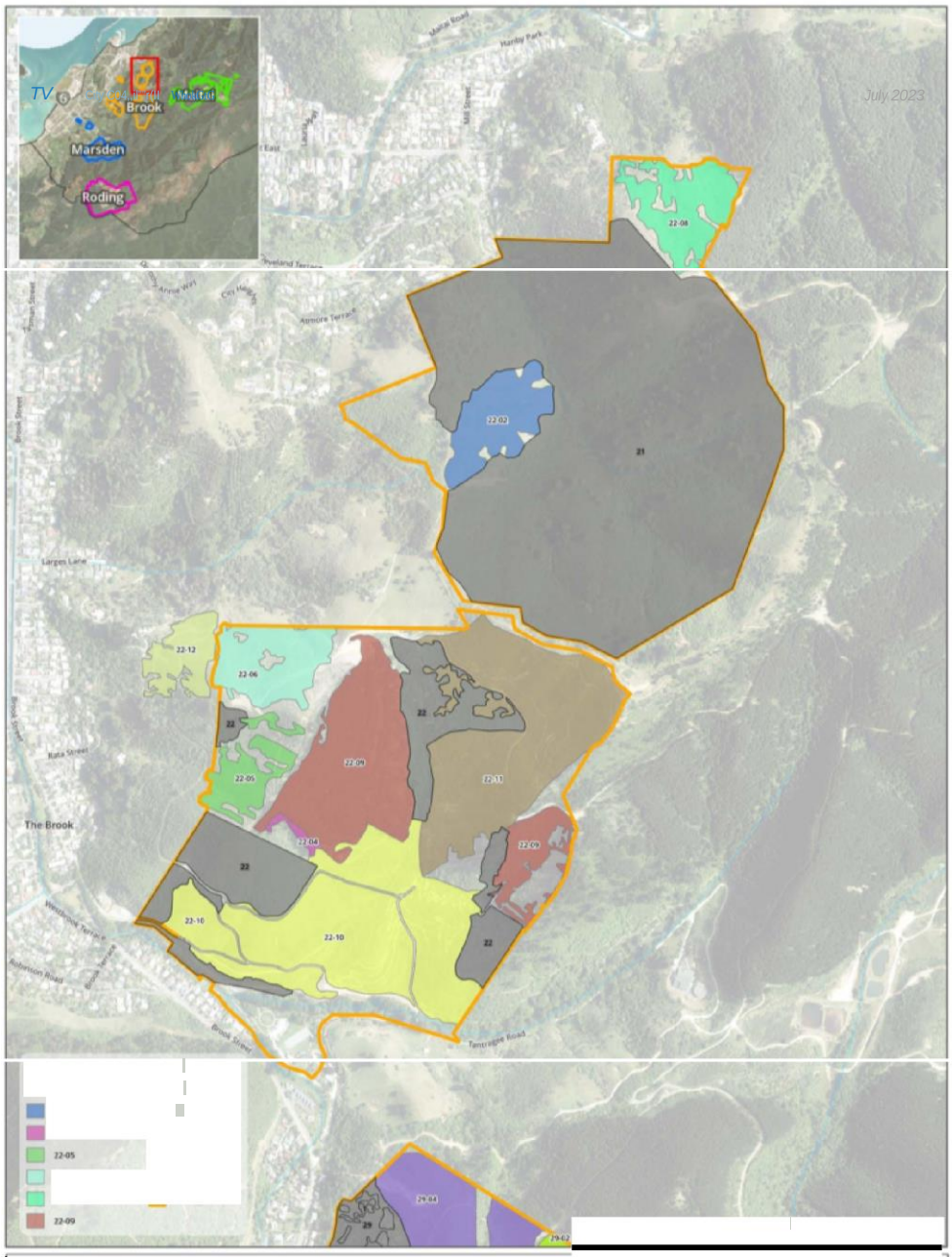
Brook
Maltat
Marsden
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July 2023
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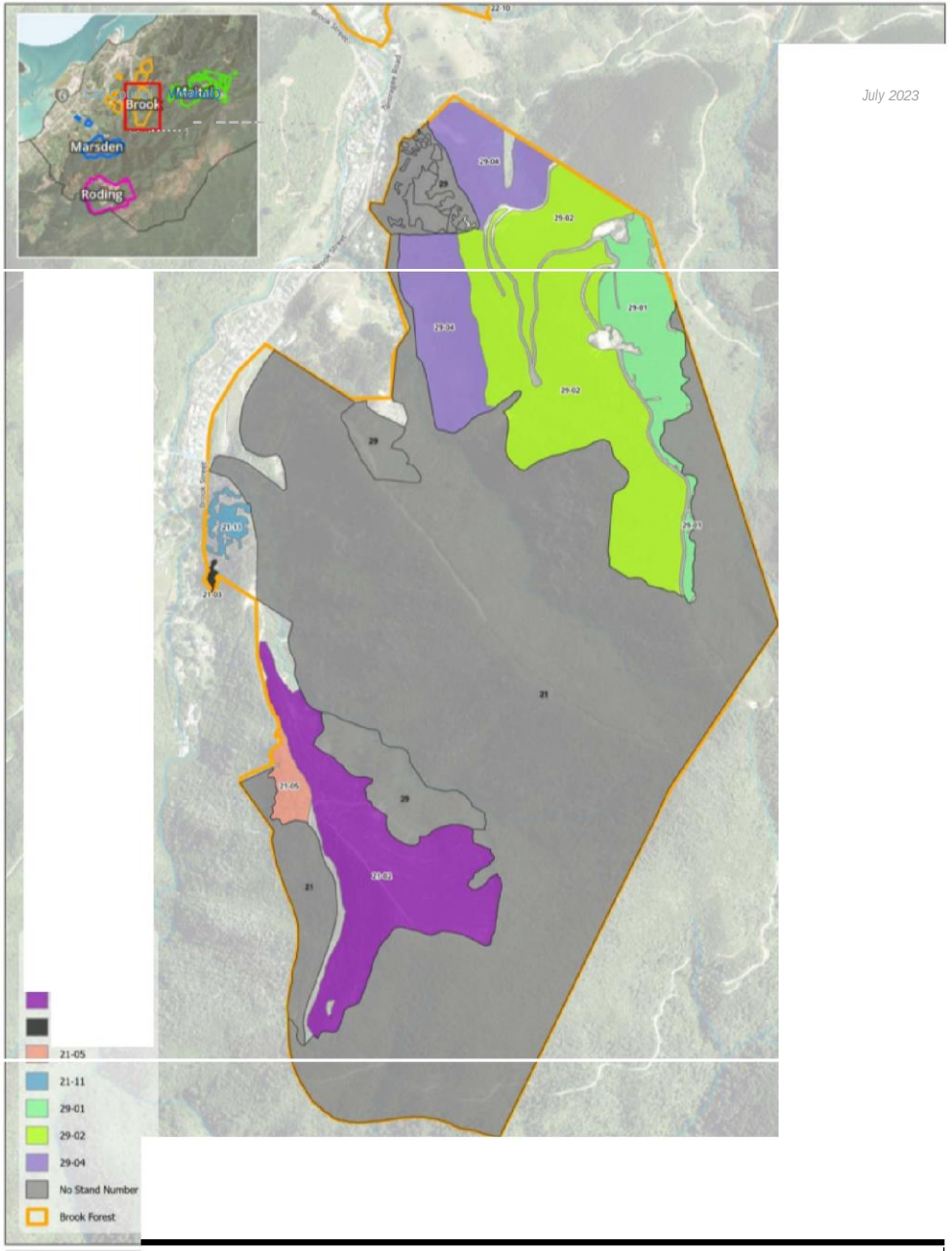
22-09


Brook
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Roding
July 2023
21-05
21-11
29-01
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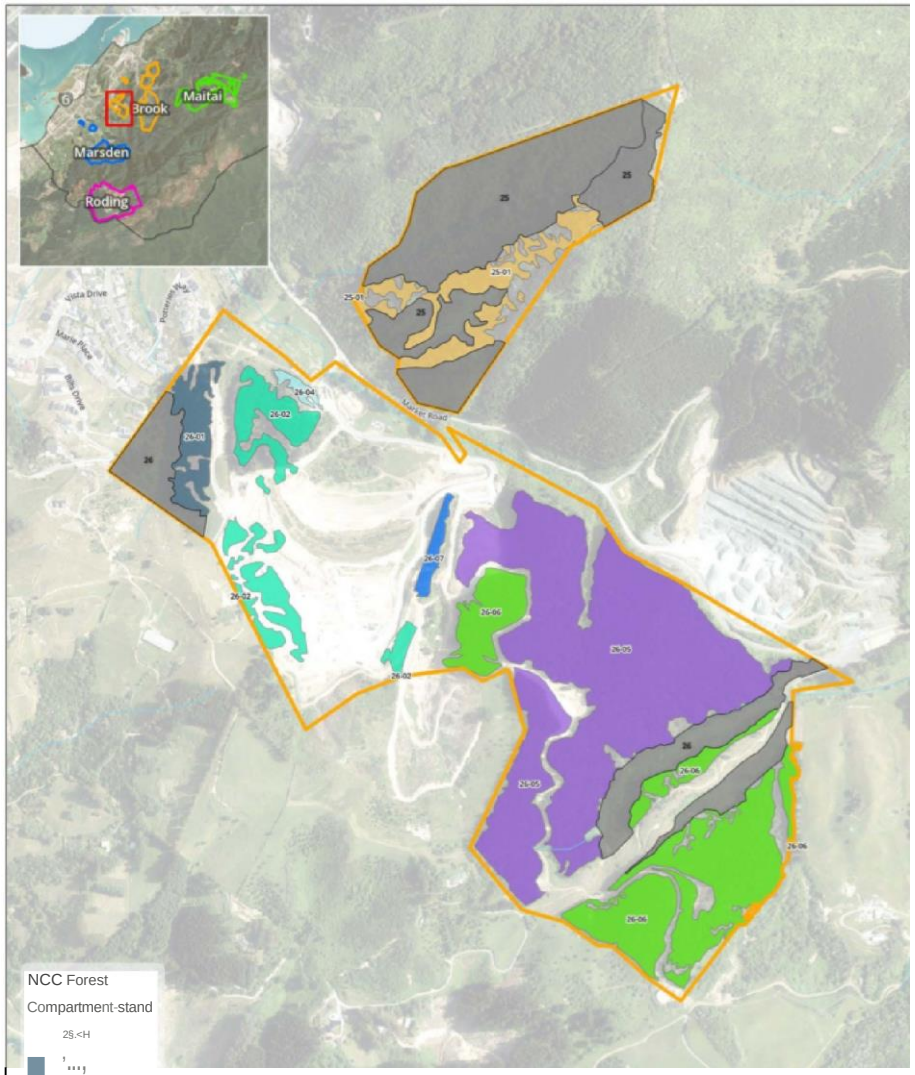
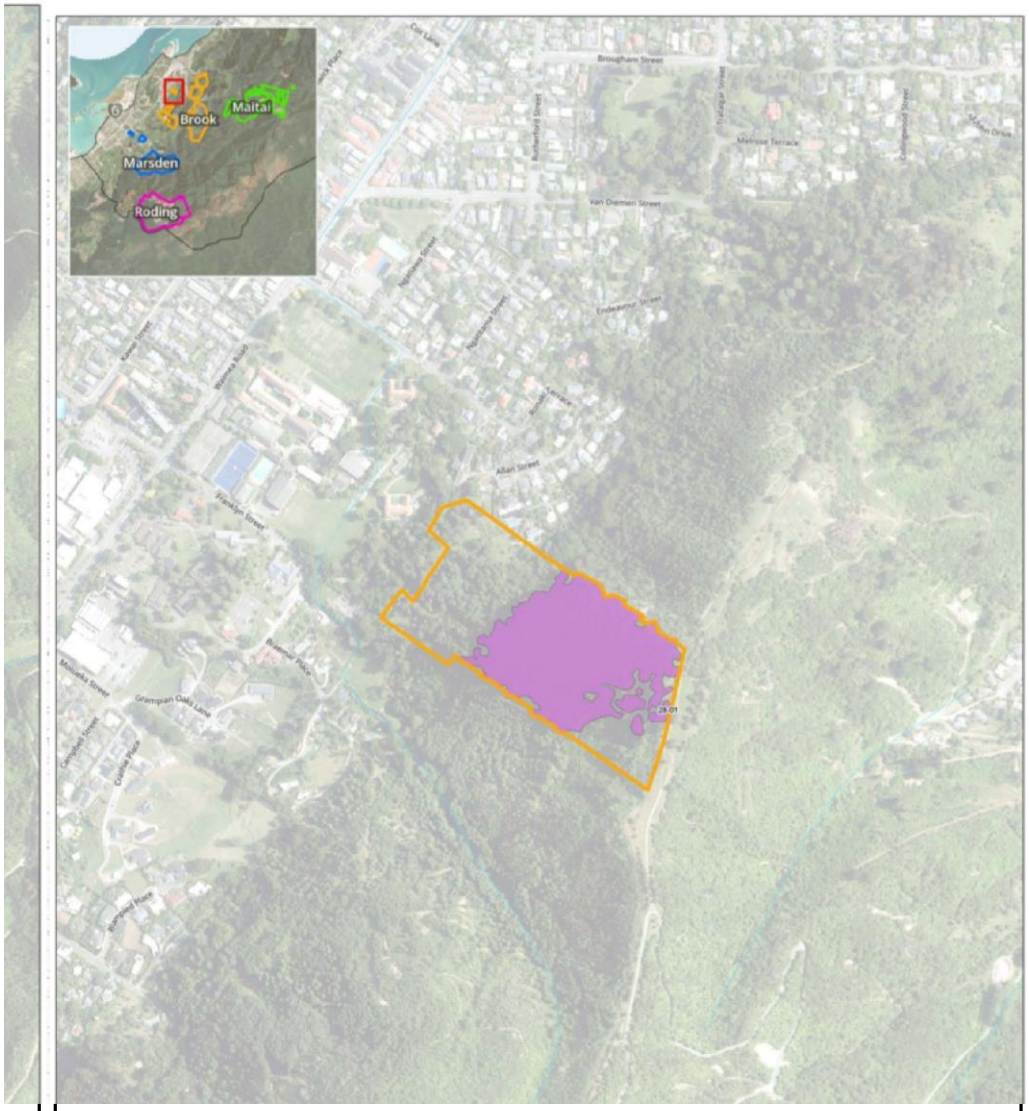
29-04
No Stand Number
Brook Forest



NCC Forest Stands - Brook Forest Map West

Right Tree Right Place

Scale 1:7,000



NCC Forest Stands - Brook Forest Map North West

Right Tree Right Place

Scale 1:5,000

July10Z3

APPENDIX: BROOK CATCHMENT FOREST BLOCKS SUMMARY/STATUS[37] RECOMMENDATIONS

Note: LV Rec = Landvision 2018 Report Recommendation[38]; FTW = fell to waste
Non-monetary value: A = amenity; B = biodiversity; R = recreation; H = housing

Stand	Area (ha)	Species	Planted	Age in 2023	Harvestable/ Harvested/ Status	Comments	Monetary Value	Non-monetary Value	Forbes Recommendation	Taskforce Recommendation
21.03	.2	Douglas fir	1986	NA	Amenity	Parks & Reserves Unharvested. Amenity.	Low	High: A, B, R	NA	Permanent afforestation
21.04	5.2	Was P radiata	1986	NA	Harvested 2016	Parks & Reserves LV Rec: Permanent reforestation indig & exotic	Low	High: A, B, R	Passive regeneration	Passive regeneration
21.04	13.4	Was P radiata	-	NA	Harvested 2016	Parks & Reserves LV Rec: Permanent reforestation indig & exotic	Low	High: A, B, R	Passive regeneration	Passive regeneration
21.05	2.2	Mixed	1960	NA	Amenity	Parks and Reserves. Amenity. Some poisoning, felling where unsafe next to walking track.	Low	High: A, B, R	NA	Permanent afforestation
21.05	.6	Was P radiata	-	NA	Harvested 2016	Parks & Reserves LV Rec: Permanent reforestation indig & exotic	Low	High: A, B, R	Passive regeneration	Passive regeneration
21.11	1.2	Redwood	1934	NA	Amenity	Parks & Reserves Permanent forest for amenity	NA	High: A, B, R	NA	Retain for amenity
22.01	9.6	Was P radiata	NA	NA	Harvested & indig reveg	Parks & Reserves LV Rec: Clear & indig reveg	Low	High: A, B, R	Assisted regen & planting (small area)	Assisted regen & planting
22.02	3	Was P radiata	1981	NA	Harvested 2021 & indig reveg	Parks & Reserves LV Rec: Clear & indig reveg or mixed native exotic silviculture PFO: Deemed unproductive	Low PFO not valued	High: A, B, R	Transitional forestry	Assisted regen & planting

[37] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.40.
[38] Landvision. (2018). Nelson City Council Forestry Alternative Management. P.37-41. (linked here)

Stand	Area (ha)	Species	Planted	Age in 2023	Harvestable/ Harvested/ Status	Comments	Monetary Value	Non-monetary Value	Forbes Recommend-ation	Taskforce Recommend-ation
22.03	5.8	Douglas fir	1983	NA	Harvested 2014	Parks & Reserves LV Rec: Clear & indig reveg or mixed native exotic silviculture	Low	High: A, B, R	Assisted regen	Assisted regen & planting
22.04	.4	P radiata	1983	40 yrs	PFO harvest 2039	PFO: Harvest with 22.09 LV Rec: Clear & indig reveg or mixed native exotic silviculture	PFO $32k/ha[39]	High: A, B, R Tourism $$	Assisted regen	Assisted regen & planting
22.05	1.6	P radiata	1987	NA	Harvested 2021	Parks & Reserves LV Rec: Clear & indig reveg or mixed native exotic silviculture	Low	High: A, B, R	Assisted regen	Assisted regen & planting
22.06	3.5	P radiata	1988		Harvested 2021	Parks & Reserves LV Rec: Clear & indig reveg or mixed native exotic silviculture	Low	High: A, B, R	Assisted regen	Assisted regen & planting
22.08	3.4	Douglas fir	1981		Harvested 2021	Parks & Reserves LV Rec: Clear & indig reveg PFO: Deemed unproductive	Low PFO not valued	High: A, B, R	Assisted regen	Assisted regen & planting
22.09	11	P radiata	2011	12 yrs	PFO harvest 2039	LV Rec: Clear & indig reveg or mixed native exotic silviculture NMTBC: Priority to build new trails of easier grade when cleared. Earmark funds for trail building and native reafforestation.	PFO $36k/ha	High: A, B, R Tourism $$	Assisted regen	Harvest OR transitional forestry; then build trails, then assisted regen & planting
25.01	2.5	Macro-carpa	1994	29 yrs	2030	PFO: Currently productive. Unharvestable. Change to amenity. Grampians Reserve indig forest. LV Rec: Poison/FTW & indig reveg.	Low	High: A, B, R	Transitional forestry	Poison / FTW / harvest, then assisted regen
26.01	1.9	Macrocarpa	1994	29 yrs	PFO harvest 2037	Buffer between residential and landfill Landfill needs/preferences are priority here.	PFO $15k/ha	High: A, B, R, H	NA Landfill use/buffer/amenity	Replant for amenity/permanent forests when/if harvested
Stand	Area	Species	Planted	Age in	Harvestable/	Comments	Monetary	Non-	Forbes	Taskforce

[39] PF Olsen. (2023). NCC Tree Crop Valuation 2023. p.40. (linked)

	(ha)			2023	Harvested/ Status		Value	monetary Value	Recommend-ation	Recommend-ation
26.02	1.65	P radiata	1987	36 yrs	PFO harvest 2023	Buffer between residential and landfill Landfill needs/preferences are priority here. LV Rec: Harvest & indeg reveg	PFO $42k/ha	High: A, B, R, H	NA Landfill use/buffer/amenity	Replant for amenity/permanent forests when/if harvested
26.02	1.8	P radiata	1987	36 yrs	-	Landfill needs/preferences are priority here. Buffer between residential and landfill LV Rec: Harvest & indeg revegg	Low	High: A, B, R, H	NA Landfill use/buffer/amenity	Replant for amenity/permanent forests when/if harvested
26.04	.2	Eucalyptus	1998	35 yrs	-	Landfill needs/preferences are priority here. LV Rec: Do not harvest	Low	High: A, B, R	NA Landfill use/buffer/amenity	Retain for amenity
26.05	19.8	P radiata	2009	14 yrs	PFO harvest 2037	Landfill needs/preferences are priority here. LV Rec: Harvest & indeg reveg	PFO $36k/ha	Future landfill	NA Landfill use	Replant for amenity/permanent forests when/if harvested
26.06	13	P radiata	2010	13 yrs	PFO harvest 2037	Landfill needs/preferences are priority here.	PFO $34k/ha	Future landfill	NA Landfill use	Replant for amenity/permanent forests when/if harvested
26.07	.4	P radiata	2012	11 yrs	PFO harvest 2037	Landfill needs/preferences are priority here. LV Rec: Harvest & indeg reveg	PFO $29k/ha	Future landfill	NA Landfill use	Replant for amenity/permanent forests when/if harvested
28.01	3	P radiata	1993	20 yrs	PFO harvest 2023	Grampians block above Nelson College LV Rec: Harvest & indeg reveg	PFO $30k/ha	High: A, B, R, H	Transitional forestry	Harvest then assisted regen & planting
Stand	Area (ha)	Species	Planted	Age in 2023	Harvestable/ Harvested/	Comments	Monetary Value	Non-monetary	Forbes Recommend-	Taskforce Recommend-

					Status			Value	ation	ation
29.01	9.49	P radiata	2013	10 yrs	2040	Currently in production forestry plan NMTBC: Priority to build new trails of easier grade when cleared.	PFO $36k/ha	High: A, B, R, H Tourism $$	Transition forestry	Active transition / prioritise recreation Harvest then, build trails, then assisted regen & planting
29.02	33.9	P radiata	2014	9 yrs	2041	Currently in production forestry plan NMTBC: Priority to build new trails of easier grade when cleared.	PFO $36k/ha	High: A, B, R, H Tourism $$	Transition forestry	Active transition / prioritise recreation Harvest then, build trails, then assisted regen & planting
29.04	15.9	Native plantings	2014	NA	Amenity	Steep areas of 29.01 and 29.02 removed from production after harvest and replanted in native species. Active landslide area has endangered homes below.	NA	High: A, B, R, H	NA	Assisted regen & planting

Brook Catchment Non-monetary Values per 2016 Catalyst Report[40]

Annex 5: Non-monetary values associated with Nelson City Council's production forests

Block	Stand	Water Supply	Infrastructure			Landscapes		Residential	Archaeological	Recreation		Water quality	Ecology				
			Electrical	Road	Watermain	ONFL	Amenity			Mountainbiking/ walking	Paragliding		Wiling pines	Brook Waimarama	Bush	Karearea	Native fish
	36.07											Y			Y		Y
Brook	21.03			Y				Y		Y			Y				
	21.04									Y				Y	Y		
	21.05									Y				Y	Y		
	21.11			Y				Y									
	22.01			Y				Y		Y							
	22.02						Y			Y							
	22.03									Y			Y				
	22.04						Y			Y							
	22.05						Y			Y							
	22.06						Y			Y							
	22.08						Y			Y							
	22.09						Y			Y							
	25.01			Y						Y							
	26.01			Y				Y		Y		Y					Y
	26.02			Y													
	26.04			Y													
	26.05																
	26.06																
	26.07																
	28.01							Y							Y		
	29.01							Y		Y		Y			Y		Y
	29.02																

[40] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.43.

Recommendations per 2016 Catalyst Report[41]

Annex 6: Recommended future management of Nelson City Council's production forests

Block	Stand	Harvest	Comment	Replant	Species	Tending regime	Comments
	56.07	Y		Y	P radiata	Unpruned	
Brook	21.03	N					Retain as amenity planting
	21.04	Y	Partially clear	Y	P radiata	Unpruned	Native regeneration of currently clear area, convert remainder to native vegetation after next rotation
	21.05	N		N			Retain as amenity plantings
	21.05		Currently clear	N			Native regeneration
	21.11	N					Retain as amenity plantings
	22.01		Currently clear	N			Convert to alternate use
	22.02	Y		N			Convert to alternate use
	22.03	Y	If economic, or poison/fell to waste	Y	P radiata	Unpruned	Convert to alternate use after next rotation
	22.04	Y		N			Convert to alternate use
	22.05	Y		N			Convert to alternate use
	22.06	Y		N			Convert to alternate use
	22.08	Y		N			Convert to alternate use
	22.09	Y		N			Convert to alternate use
	25.01	N	Poison/fell to waste	N			Convert to alternate use
	26.01	Y	Harvest when landfill moves	N			Convert to alternate use
	26.02	Y	Harvest when landfill moves	N			Convert to alternate use
	26.04	Y		N			Convert to alternate use
	26.05	Y	If get to harvestable age	Y	P radiata	Unpruned	Only those areas that won't be destroyed by landfill expansion
	26.06	Y	If get to harvestable age	Y	P radiata	Unpruned	Only those areas that won't be destroyed by landfill expansion
	26.07	Y	If get to harvestable age	N			Convert to alternate use
	28.01	Y		N			Convert to alternate use
	29.01	Y		Y	P radiata	Unpruned	Part of this stand already converted to native plantings
	29.02	Y		Y	P radiata	Unpruned	This decision can be reviewed at the time of harvest

[41] Beveridge, A. (2016). Nelson City Council's Production Forests - Assessment of Non-Monetary Values. Catalyst Group. p.45.

Catchment review - Marsden

The following pages show details of commercial forest in this catchment, based on NCC's Forestry Activity Management Plan 2021-2031, with added information and commentary based on Task Force members' personal observations, as well as other data acquired during the Task Force's review.

Four Task Force members were allocated a Catchment (Forest block) to review in-depth. These four catchment authors also collaborated on their research and findings, to ensure shared understanding of common issues (such as weeds and pests) and to produce a more meaningful catchment analysis and recommendations pertaining to all catchments. Reviews involved collecting, organising, analysing, and summarising a range of data and information related to physical elements (topography, current planted species, rainfall, aspect, soil characteristics, etc.) as well as the opportunities and risks presented by the current forestry situation(s).

Catchment reviews consist of a common framework that enabled the Task Force to:

- define an approach and collate key characteristics of the area
- identify risks & opportunities
- identify all commercial forest stands, and
- make observations or note key findings for their short and long-term future management.

Each Catchment review covered these types of comparisons/analysis:

- Maps related to the Catchment area
- Parameter setting – using the Task Force Aspiration Statement and its Values Overview of the Forest Area
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- Key Elements to Consider
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    - Continue plantation forestry beyond the current rotation
    - Transition to alternate timber species (exotic and indigenous)
    - Transition to mixed exotic & indigenous amenity forest
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- Financial/Net Revenue from Production Forestry Considerations
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- Key observations
- Areas for Action for the catchment and its forest stands
- Catchment opportunities

Aspiration Statement

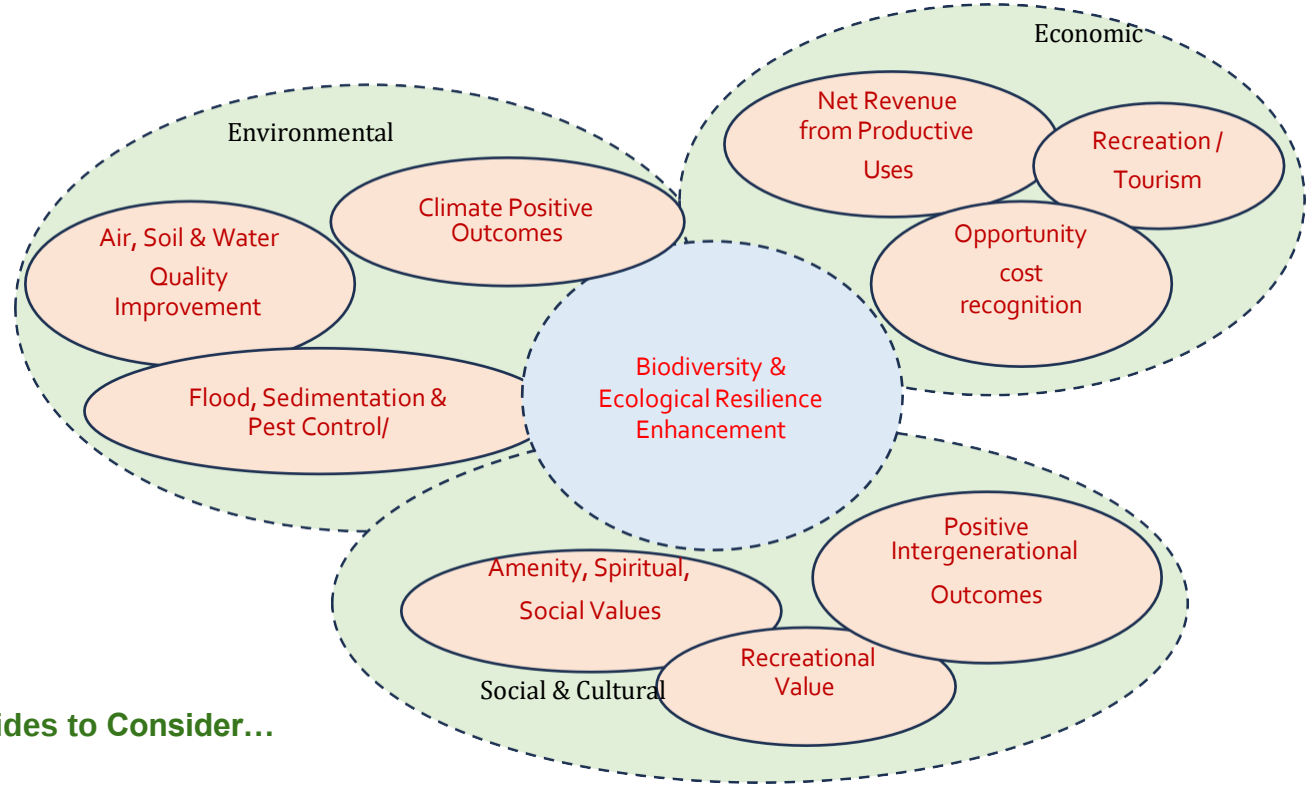
"A resilient, continuous canopy, forested landscape, rich in biodiversity, that supports the many values of the people of Te Tauihu and our future generations"

Values

Environmental
- Air, Soil, & Water Quality Improvement
- Flood, Sedimentation & Pest Control/Management
- Biodiversity Enhancement
- Climate Positive Outcomes (resilience & permanent sequestration)

Social & Cultural
- Amenity & Spiritual
- Recreational
- Biodiversity Enhancement
- Positive Intergenerational Outcomes

Economic
- Net Revenue from Productive Uses (tangible & intangible)
- Opportunity Cost
- Recreation / Tourism
- Biodiversity enhancement



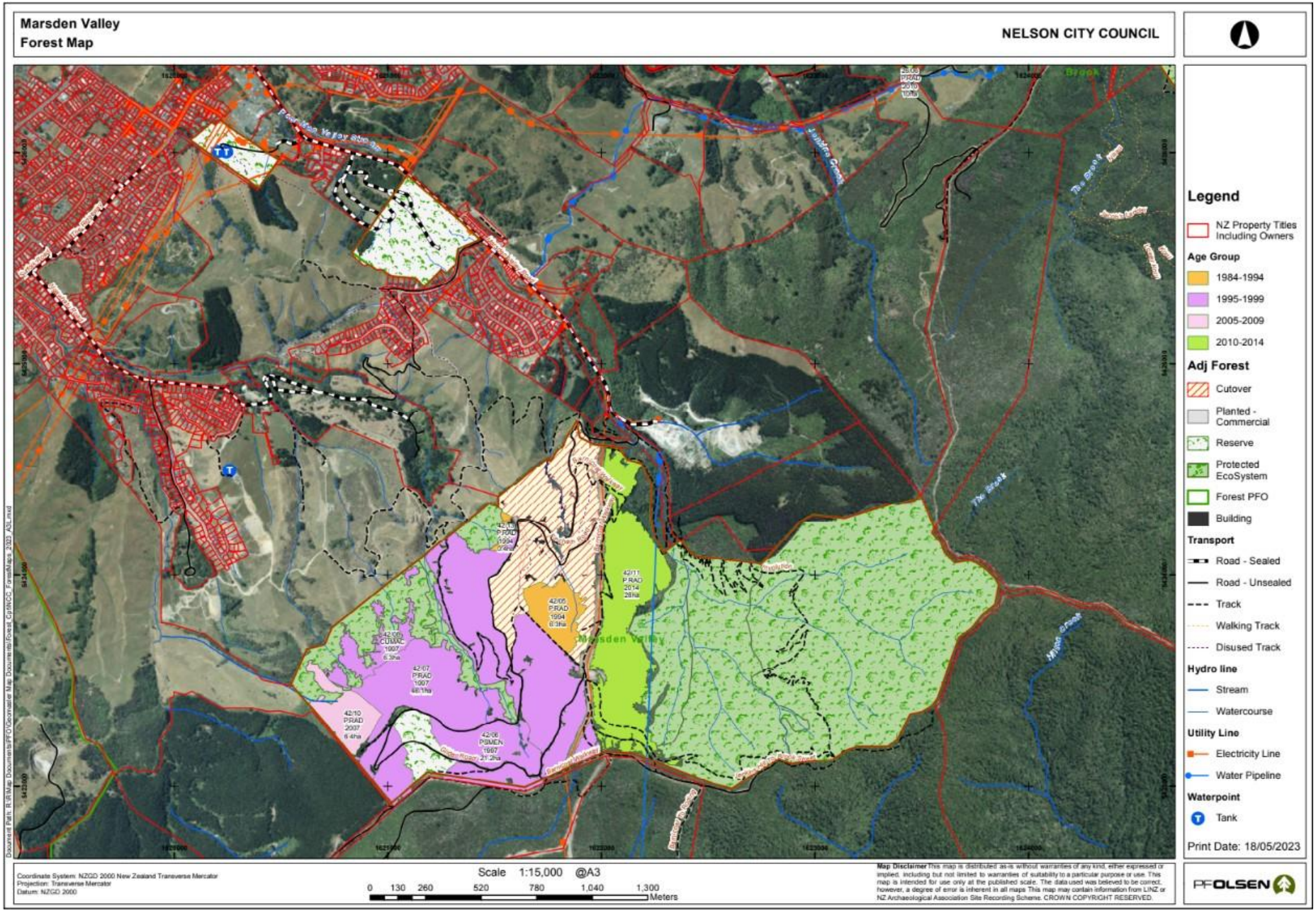
Risks, Opportunities, Parameters, Future Guides to Consider…

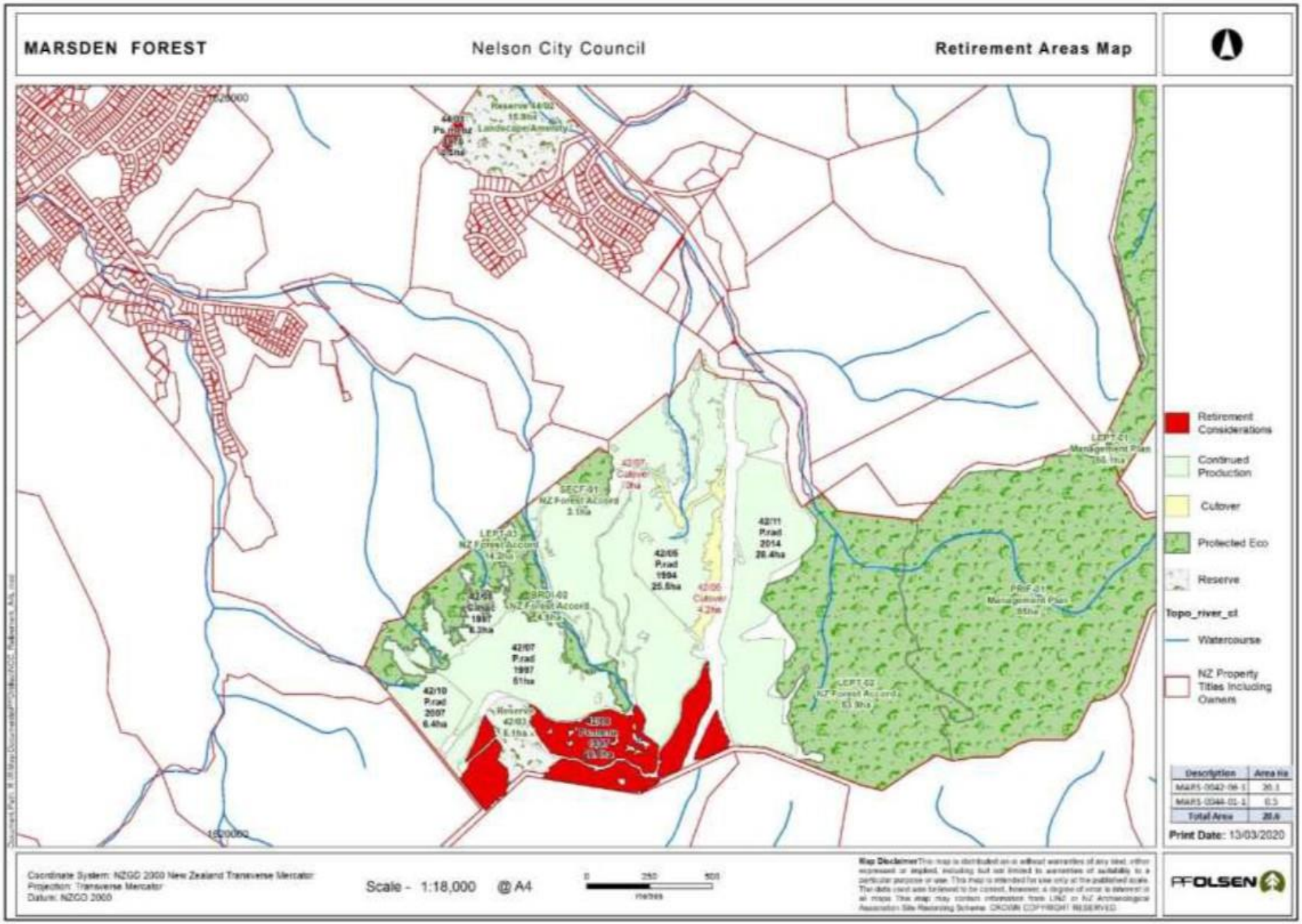
A. What are the Task Force's biggest challenges?
- Establishing a credible pathway to a more resilient forest model that meets a wide range of values
- Identifying potential 'roadblock' issues, such as:
  - Costs of transitions
  - Species mixes
  - Future uses
  - Perceptions of transition timeframes
  - Agreement on most effective societal/ institutional partnerships (shared leadership)

B. Mixed value of NCC commercial forests
- Financial returns (net)
- Financial and social values of all production costs (employment, track development and other infrastructure – costs of production)
- Biodiversity values
- Soil and water protection values
- Recreation values
- Climate change mitigation values
- Avoiding moral hazard

C. Innovative transformations
- Alternative revenue streams
- To perpetual community managed forests
- Governance structures that empower community/statutory organisations and partnerships and continuity of long-term goals and aspirations
- Forests with a wide range of species
- Forests that include some capacity for high value extraction of timbers while maintaining continuous canopies (think European models)

1. AN OVERVIEW OF THE FOREST AREA -- MAPS

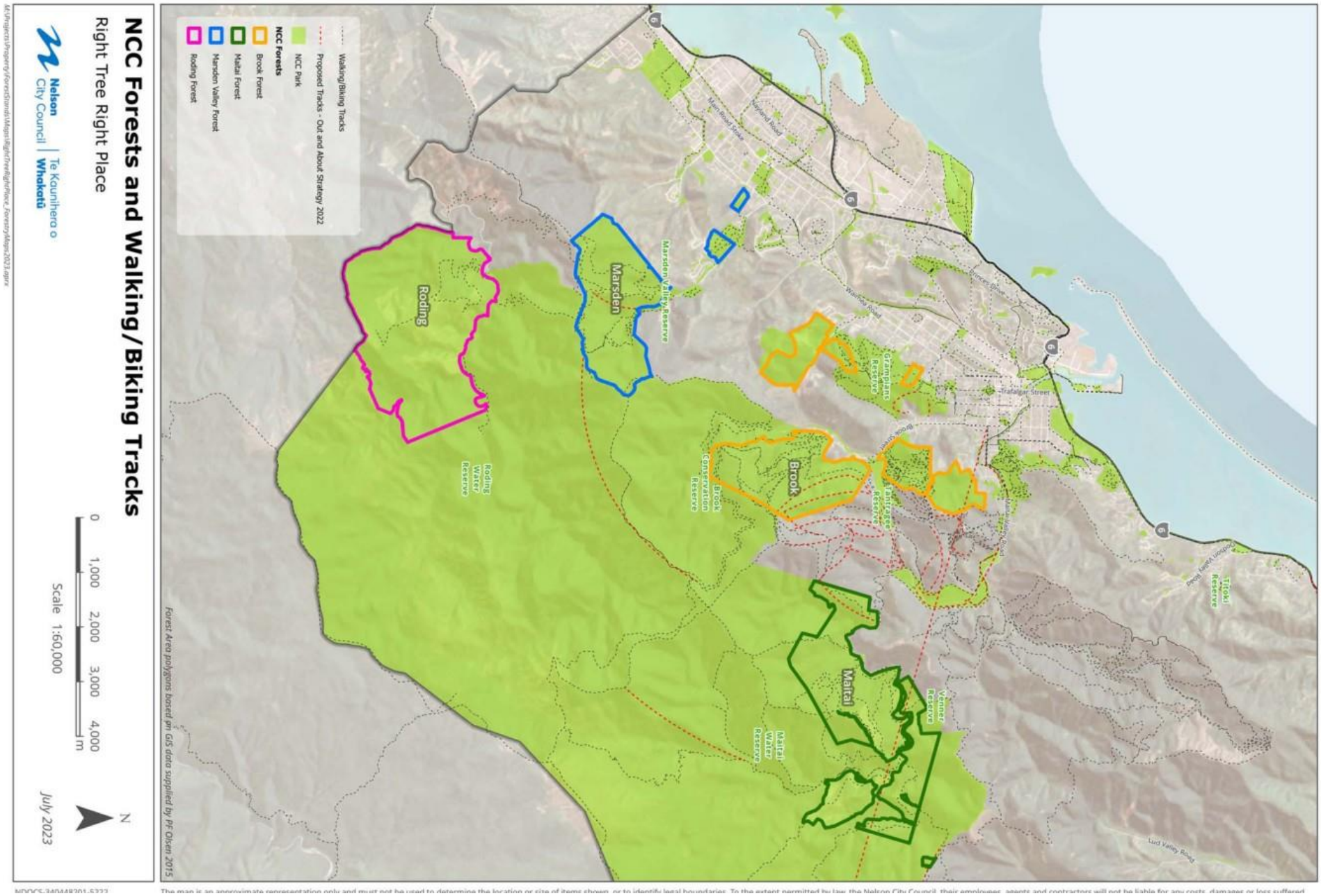




Incorporated from LandVision 2018 Report: NCC Forestry Alternative Land Management

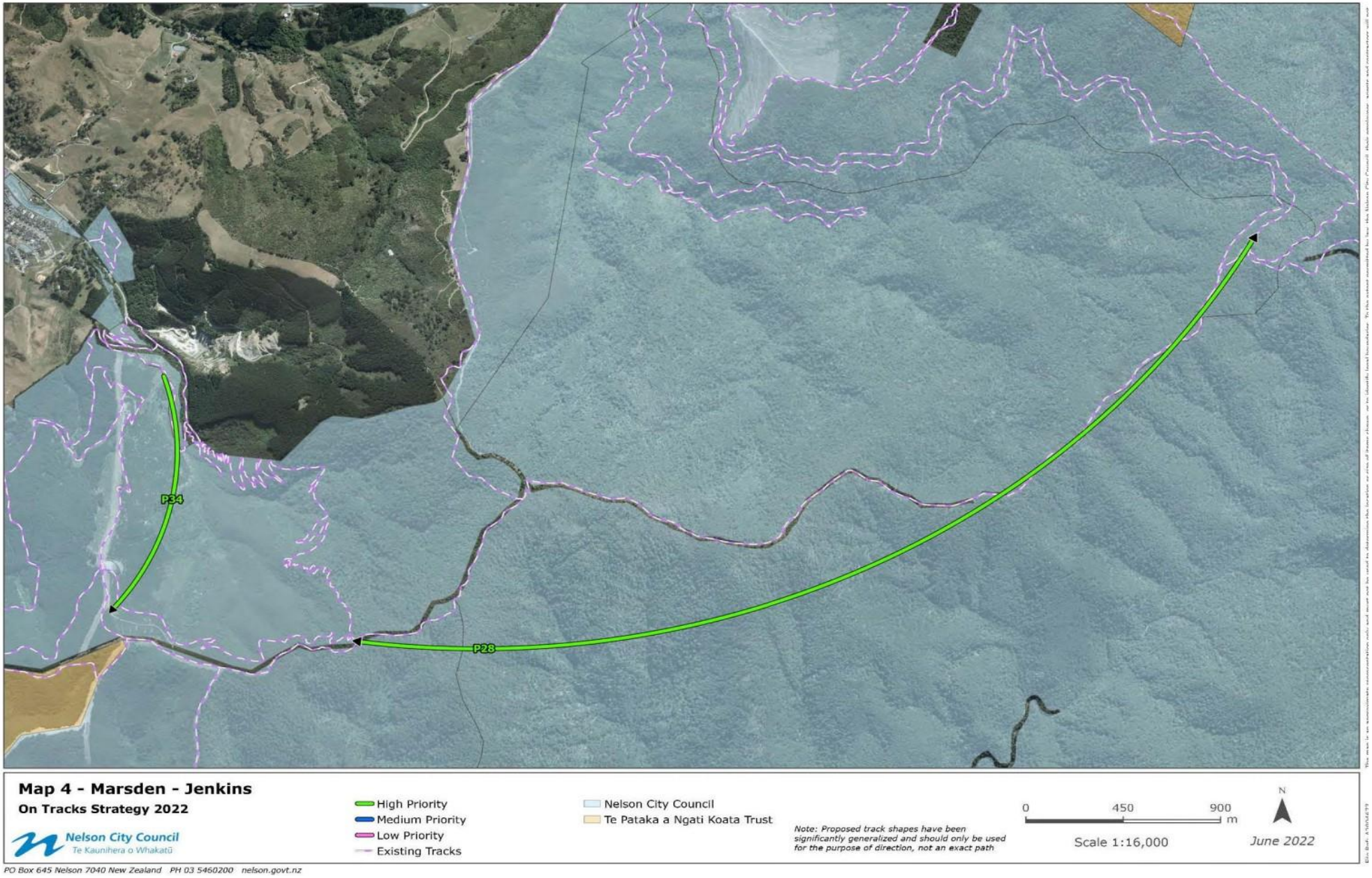
Recreational Trails Map

(view larger map here)



Marsden Catchment Existing and Proposed Tracks[1]

(view larger map here)

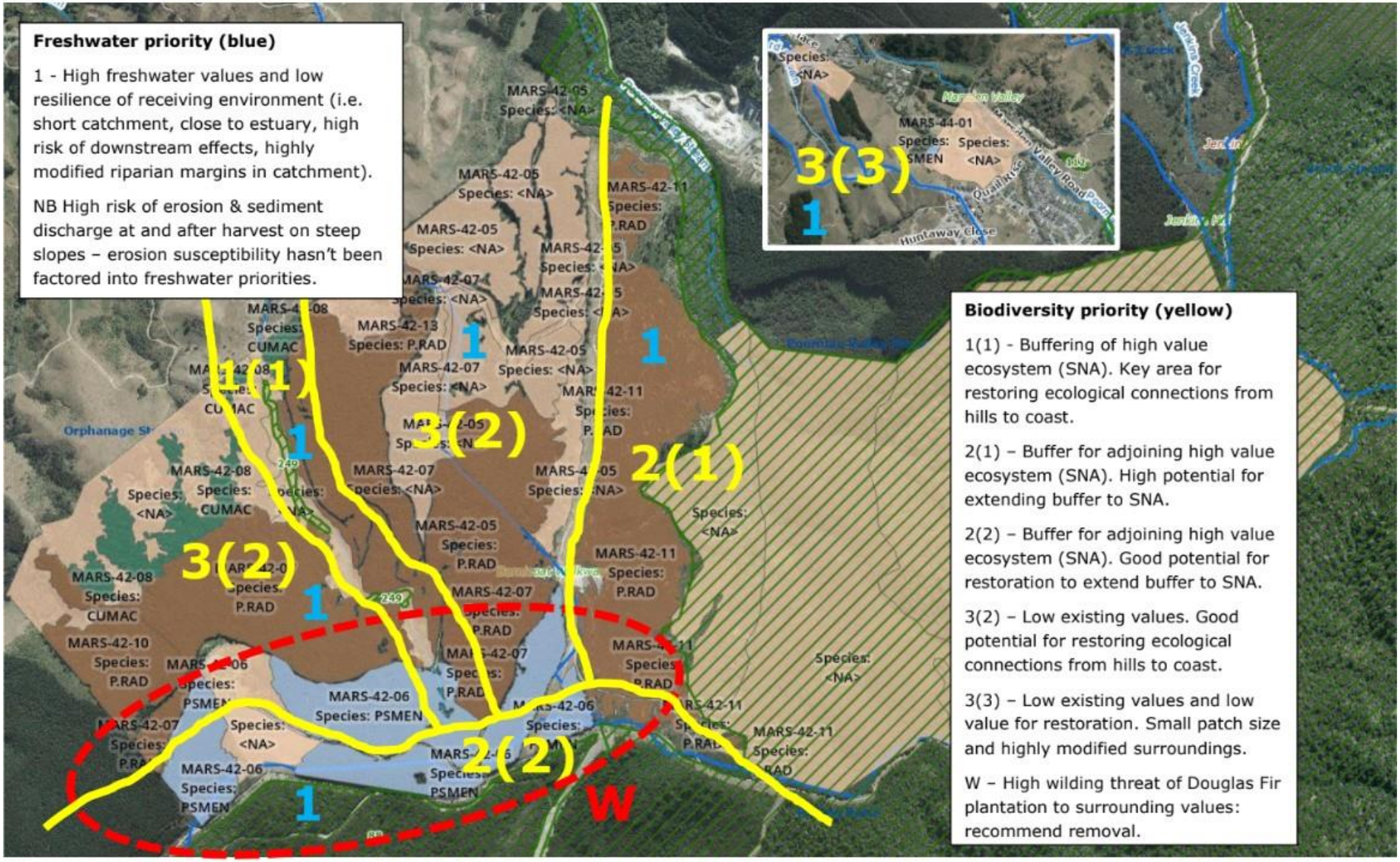


[1] Out and About On Tracks Strategy 2022, pg 25

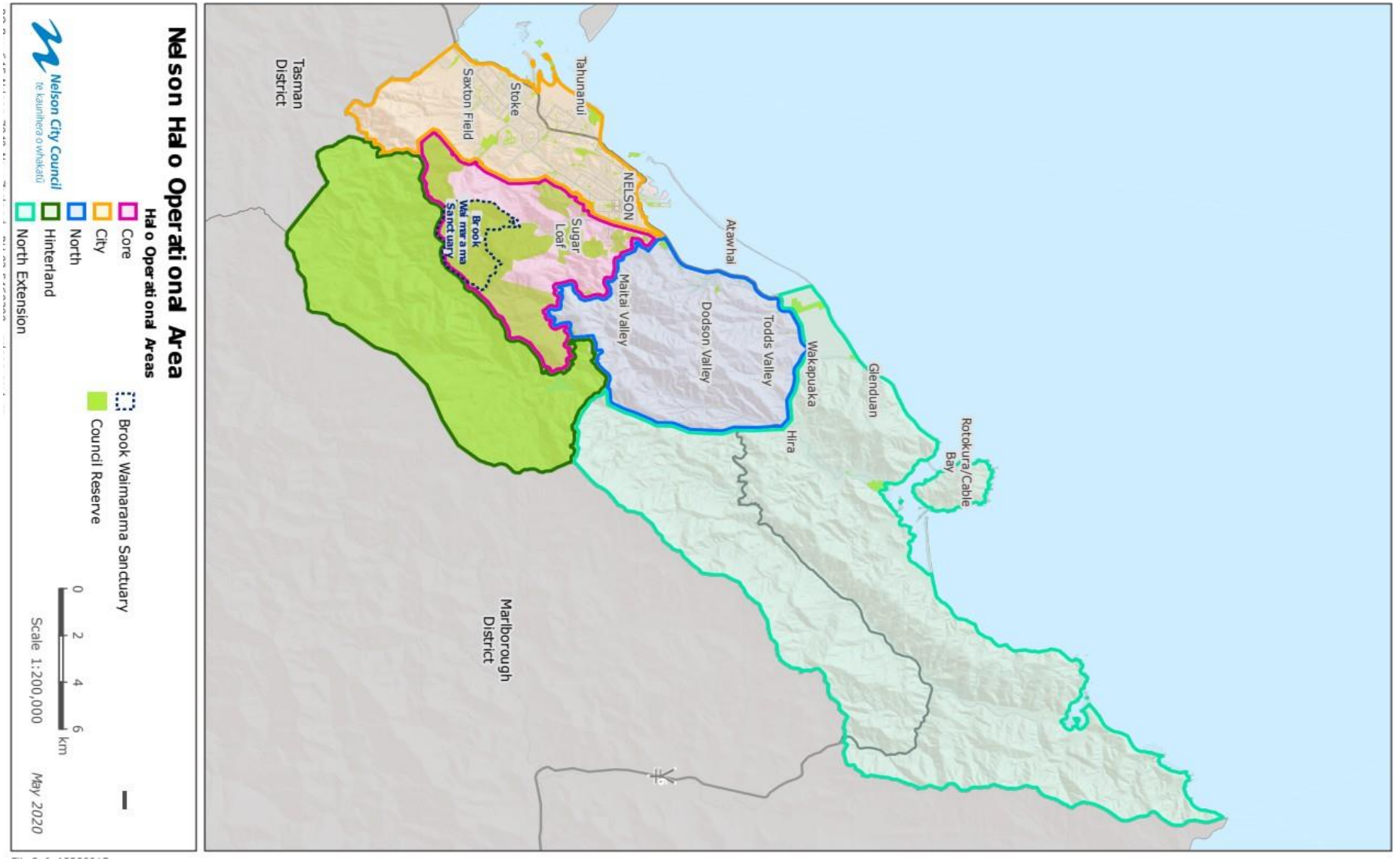
NCC Environment & Science Team Guidance/Priorities (Marsden)

(view larger maps here)

Marsden stands – biodiversity and freshwater priorities



Nelson Halo Map[2]



[2] http://www.nelson.govt.nz/environment/nelson-nature/natural-environment/the-nelson-halo/

1. AN OVERVIEW OF THE FOREST AREA - DESCRIPTION

Background	This land would have been cleared of indigenous forest, burnt, and then sowed for pasture/grazing. It is steep land and shows signs of being unstable, particularly the front face (west facing). Poorman Valley Stream and Orphanage Stream both originate on this land. The 163 ha of planted forest make up a significant portion of their catchment. The proposed harvest (which has been halted) would have left 156.6 ha of this catchment bare.
History	The catchment of these two streams are the dominant feature of the backdrop to Stoke. The gravel fan which is now Stoke has been put there by these two streams. The now housing area was market gardens and regarded as the best stone fruit orchards in NZ. The gravels in these streams is very mobile, would have choked often and spread the fan from the Black Cat dairy area to Saxton. This land would have been covered in large forests, Kahikatea, Matai, Rimu,Totora, Miro, etc., making these streams very good habitat for our indigenous species. There are two weirs that supplied water to Stoke historically and I understand they still supply the land that was Ngawhatu hospital and orphanage. PF Olsen's say there is a history of wind-throw here in an Easterly and there is evidence of that. The "takeoff " area for gliders is in this forest and is a significant site for this locally and nationally. The access road goes through this forest from the end of Marsden road diagonally to the opposite top corner. The road is blocked from time to time by slips.
Variety of landscape	Steep. Made up of soils on top of a very fractured porous rock. Orphanage stream catchment is entirely in this forest. Poorman Valley stream has the head of the valley in original Beech type forest. The northern side is pine forest (not NCC's) and a quarry. I have walked this area in heavy rain and the quarry appears to have good systems in place as no extreme flows or discoloration come from there. In heavy rain events the noise from the moving rocks is very clearly heard. In summer the lower streams are usually advertised as being toxic to dogs.
Forestry Futures	This land is not suitable for clearfell forestry. The very top of the hills is flat enough that erosion and silt may not present a significant problem but this area is small and probably does not add up to an "economic forest" on its own.

2. Key Elements to Consider

Key Element for this Forest	Describe Current Situation	Risks? (& their likelihood)	Opportunities? (& their likelihood)
Water catchment	● Weir in Poorman is at the foot of the indigenous forest and still operational. There is no catchment above the weir from production forest. ● The weir in Orphanage is buried from a slip in our forest and no longer operational	● The unstable nature of this land poses a serious risk to damage of the housing etc on the flats. This has happened in a small way twice since I have lived in Stoke, both from the streams crossing at Suffolk Road and Main Road Stoke. I do not know how liability works in this situation but it will occur again and now the trees are removed the consequences are likely to be much worse, plus you need to add climate change to that equation. There can be no doubt as to where the material (rocks and mud) from such an event will have come from.	● Both these streams have riparian margins that could be planted back in indigenous forest all the way to the sea which could restore these streams as significant habitat for indigenous species. ● A permanent forest on this land would give a wonderful recreational area for Nelson right on the doorstep of housing. Because it is so accessible it may be considered for easier gradient tracks (mobility scooter or wheelchair or elderly walkers) rather than just mountain bikers ● The glider launch area is a significant asset and a permanent forest would allow better all year access ● A permanent forest would remove a significant risk to Stoke from slipping during heavy rain events

Slopes/flats – topographical details – challenges – by compartment	● 42/06. 21.23ha. This area is in Douglas fir due to be harvested to prevent the risk of wildlings. The trees are immature and unlikely to provide a financial return ● 4/08. 6.28ha macrocarpa; This land has heavy Kanuka forest and some macrocarpa. PF Olsen's believe it is a failed macrocarpa planting and the kanuka has taken over. There are areas of grass in amongst it. Animal numbers in here are huge, deer, possums and a few pigs. This is due to the adjoining farm which helps support the deer and	● Due to being on top of the ridge and predominantly not overly steep the slipping/erosion risk is minimal. I am not convinced there is a serious enough risk of wildlings to make their removal urgent. ● Olsen's harvest plan includes the northernmost ridge in this compartment as anchor points. This will damage a lot of the kanuka and open up lightwells which will need replanting immediately to prevent weeds taking over. ● There is no evidence that this area is particularly unstable.	● Because of the easier contour of this land it may be cost effective to harvest in stripes and plant over time rather than clearfell. Thus using the trees as weed control while permanent species get established ● There is no gorse in this block as it has never had machinery in it since planting. The kanuka is an example of what would be there when there is no gorse. The grass patches are too thick for anything to germinate through them. Once the turf is broken things will germinate but the Kanuka should win. The grass is browntop, cocksfoot and twitch. This is what you will find on any hill like this. It is what naturally takes over and forms a turf that nothing will germinate through.

	possum population. The damage to the indigenous forest is total. ● 42/11. 28ha. This was harvested and replanted in 2014. It is a north facing block from ridgeline to Poorman stream. ● 42/10. 6.4ha. This is a small area on the south/west boundary that was planted in 2007. It is steep. It appears to have been planted (and probably harvested) together with the neighbouring block belonging to Tasman forest. ● 42/05, 42/07, 42/12, 42/13. This is the remaining forest that has either been cut over or was about to be cut. The cut over areas have some regeneration dominated by gorse and vines. The western boundary adjoins the Ngawhatu and Marsden subdivisions. The land is steep and unstable.	● Infrastructure for harvesting by hauler is in place from last time ● I would be in no hurry to harvest this. However, to get to it for harvest would need to be either done at the same time as the neighbour, or, to delay harvest of a section of our forest that would be needed for access to this block. I would prefer the latter so as to keep control of how and when or if you harvest. ● Slipping into the streams particularly the Orphanage. These streams are already very degraded and this will not help. Damage to housing and infrastructure downstream in Stoke.	● I find it unusual that the "forestry" grasses that are recommended to sow on harvested areas contain none of these species. ● Leave to mature and harvest to generate funds for planting permanent forest ● Possible income from harvest or in the meantime we may learn about regen without felling. ● This is the "front" of this block very close to Stoke and adjoining two subdivisions. Wonderful opportunity to plant a permanent forest for enjoyment for all. ● Permanent forest here will play its part in the restoration of the biodiversity in the two streams
Tourism	● Glider launch is of national significance for recreation/tourism. Lovely backdrop to Stoke and very accessible for walking etc.	● Slips and fire will remain a risk until a forest gets established, 10 plus years.	● This links the housing on the west border to the indigenous on the northeast boundary
Recreation	● Many walkers, mountain bikers, and paragliders.	● Fire	● This area is so close to town and a permanent forest would look stunning as a backdrop. The views from the forestry are also stunning. This is such an accessible place to get too that it would be great to look at some easier walks that could include mobility scooters and wheelchairs or at least that end of the spectrum rather than hard out mountain bikers.

Cultural/amenity aspects	● These are two short steep gullies, unlikely to have any past significance	● Finding out they do have significance.	● Great amenity so close to housing
Pests – (plant & animal)	● Deer, possums, stoats, cats, rats, pigs.H ave never seen any evidence of goats even though there is some good habitat in Orphanage stream. ● Gorse, wildling pine,passionfruit, Tobacco plant, old man's beard.	● The damage from deer is huge. Possums are also in large numbers. ● Weeds in the already harvested areas need urgent attention otherwise cost of control will rise rapidly. These weeds will also affect the cost and success of planting operations.	● No opportunities here other than “do it now” as the costs will rise and results will diminish.
Biodiversity	● The northeastern boundary is original indigenous forest (SNA) so opportunity for biodiversity to expand.	● These two streams are already at the bottom of the chart for biodiversity. Cutting this forest is clearfell of the entire ecosystem of orphanage stream and at least half of Poorman stream. Radiata is not a good custodian of our soil and biodiversity. Its effects are negative.	● Basically there is only opportunity as the starting point is so low. These streams are very short and NCC own, or have control of, the entire catchment. There is no reason we cannot restore the biodiversity other than lack of “ will”.

3. SCENARIO ASSESSMENT

Forest Area assessed against these Values criteria. Note the scoring, 1-5, with 1 being low value/poor outcome, and 5 being high value/beneficial outcome.

	Transition / Continuation								
Value ➔ & Scenario ⬇ 1=low / 5=high	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (X out of 40)**
Plantation Pine (clearfell management) Score / Total	5	4	*3*	1	2	1	1	1	18 / 40
Alternative continuous cover species (native and/or exotic) Score / Total	2	3	1	4	4	4	4	4	26 / 40
Mixed native & exotic amenity forest Score / Total	4	4	1	4	4	4	4	4	29 / 40
Native forest via natural regen (NR) and/or active planting (AP) Score / Total	1	5	1	5	5	5	5	5	32 / 40

4. FINANCIAL / NET REVENUE FROM PRODUCTION FORESTRY CONSIDERATIONS

Stumpage Summary by Stand[3]

Forest	Stand	Planted	Yield Table	NSA	Age of	Stumpage $ value / ha	
MARS	0042-05	1994	42044CF-S25	6.32	29	44,531	281,438
MARS	0042-06	1997	29888MR-S25	21.23	26	4,208	89,329
MARS	0042-07	1997	42045CF-S25	46.06	26	33,049	1,522,225
MARS	0042-08	1997	MAC	6.26	35	24,682	154,507
MARS	0042-10	2007	42047MR-S25	6.4	27	20,092	128,589

Tree crop market value by stand[4]

Forest	Stand	Planted	Yield Table	NSA	Age of	Stumpage $ value / ha	
MARS	0042-05	1994	42044CF-S25	6.32	29	44,529	281,422
MARS	0042-06	1997	29888MR-S25	21.23	26	4,207	89,309
MARS	0042-07	1997	42045CF-S25	46.06	26	33,045	1,522,045
MARS	0042-08	1997	MAC	6.26	35	9,836	61,576
MARS	0042-10	2007	42047MR-S25	6.4	27	5,722	36,624

[3] PF Olsen, Nelson City Council, Tree Crop Valuation. Maitai, Marsden, Brook, Roding. Reporting Period: June 2023. P.38. (linked here)
[4] Ibid. p.40.

5. MARSDEN CATCHMENT STAND-BY-STAND ASSESSMENT

For stand reference maps refer here.
NOTE: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)					**Assessment against scenarios (all of which produce tall canopy forests)**				
Stand Number	Area (ha)	Value ($) / ha	Species	Year planted / estab-lished	**1) Plantation forestry** (pinus radiata) **Scenario (1A)** Transition post mature harvest **Scenario (1B)** Active transition pre maturity	**2) Alternative continuous cover timber species** (native and/or exotic)	**3) Mixed native and exotic amenity forest tree cover**	**(4) Native forest tree cover** via: **(P)** planting, or **(AR)** assisted regeneration, or **(PR)** passive regeneration	**Comments** NB. Refer appendix for further detail on specific values for each stand, species and year harvested. Code: PFO = PF Olsen UMo = Under management of Wildings = wilding pines
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇									
MARS 41.	0.9	NA	Wilding					P ✓✓✓ AR ✓✓	Regenerating in weeds and wilding pine.
MARS 42.05	29.76	NA **ETS**	P radiata	0		✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	Land registered in ETS as stock change. Harvested in 2023. Action needed. Weed control required - aerial plus gun and hose on the edges.
MARS 42.07	~ 5 ha of 51.03	NA **ETS**	Was P radiata	0		✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	Land registered in ETS as stock change. Partially harvested in 2023. Action needed. Weed control required - aerial plus gun and hose on the edges.
MARS 42.13	0.45	NA	P radiata	1994		✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	Adjacent to 42/07 unknown why it has its own stand status. Heavy weed load. Needs attention.
MARS 44.01	0.49	NA	Douglas fir	1976			✓✓	P ✓✓✓ AR ✓✓	Isolated. Part of the cemetery. Consider removal and transition to natural burial for ash interment, if suitable.
5 stands	**36.6 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇									

MARS 42.06	21.23	4,208 **ETS**	Douglas fir	1997				P ✓✓✓ AR ✓✓	Registered in ETS as averaging. Once replanted could be registered into 'permanent' category in ETS. Any replanting plans should be done in consultation with
MARS 42.07	~46 ha of 51.03	NA **ETS**	Was P radiata	1997	1A✓✓ 1B✓✓✓	✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	Land registered in ETS as stock change. Partially harvested in 2023. Action needed. Weed control required - aerial plus gun and hose on the edges. Area on SW boundary (south of glider takeoff), should be considered for harvest with 42.10, or transition together - so any intervention (harvest or transtion) is done in a way that is compatible for the whole area.
MARS 42.08	6.26	24,682 **ETS**	Macro-carpa	1997		✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	Registered in ETS as averaging. Cmac dying out. Is an ETS stand, needs to stay stocked - potential underplanting required.
MARS 42.10	6.4	20,092	P radiata	2007	1A✓✓ 1B✓✓✓		✓✓✓	P ✓✓✓ AR ✓✓	Access for this block is complicated because it is through 42.07; so any transition or harvest plan has to be done in consideration of 42.07, to maximise opportunities and minimise risk.
4 stands	**79.89 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇									
MARS 42.11	28	19,521	P radiata	2014	1A✓✓✓ 1B✓	✓✓✓	✓✓✓	P ✓✓✓ AR ✓✓	All infrastructure is there from last; should be little cost with infrastructure for harvest.
1 stand	**28 ha**								
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇									
0 stands	**0 ha**								
9-10 stands	**144.49 ha in Marsden Catchment needing transition / awaiting transition / underway with transition / or transitioned and need monitoring**								

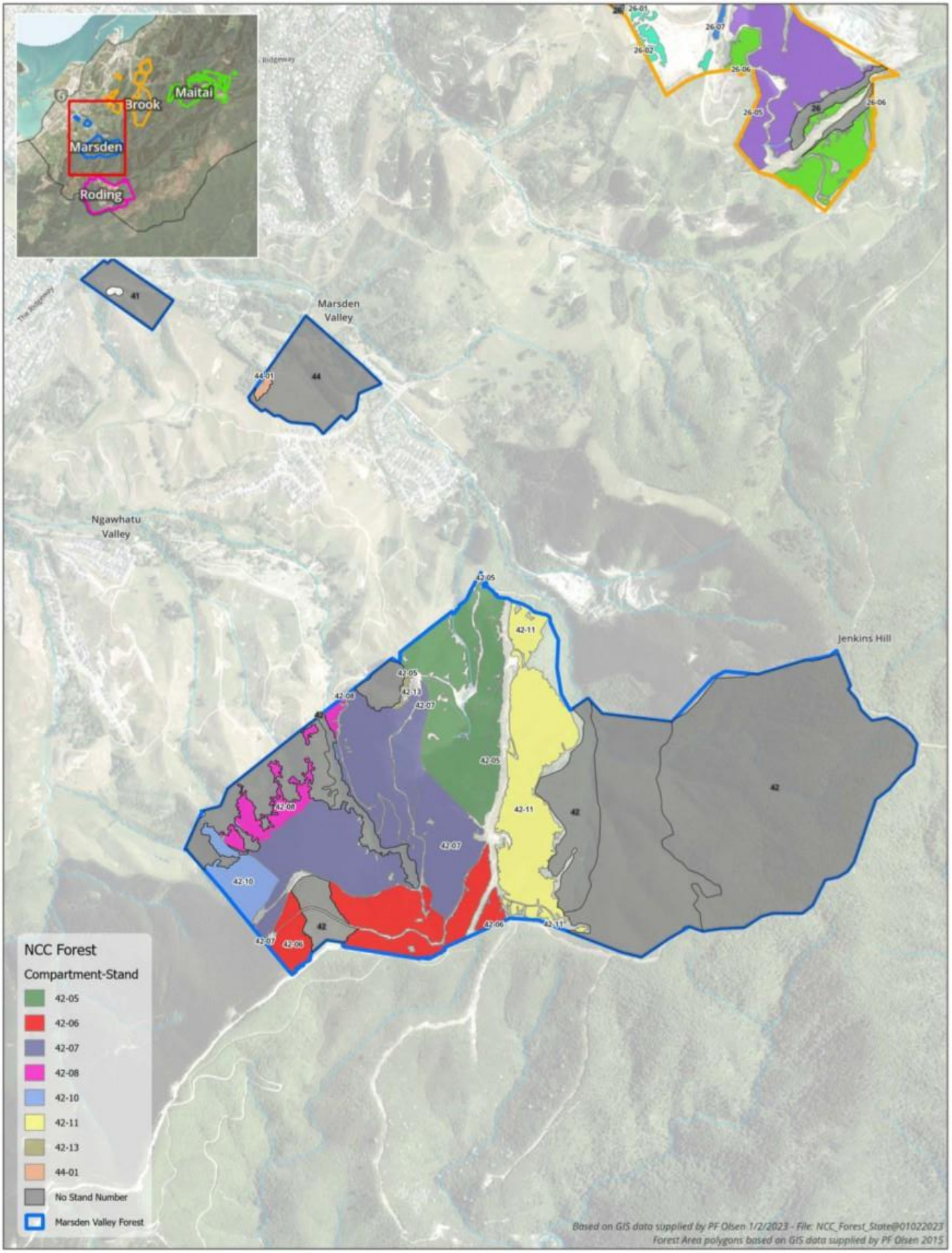
6. KEY OBSERVATIONS FOR THE MARSDEN CATCHMENT AND FOREST STANDS

There are three stand out issues in this forest area:

1. About 40% of the catchment of Poorman Stream and 100% of Orphanage Stream originate in this block. The original reason for cutting trees, I understand, was that there had been a windfall. One lower gully was not harvested despite there being a skidsite adjacent to it. This gully then slipped into the neighbour below filling their gully in spoil and trees up to 10m deep. The weir near the bottom seems to have halted the flow of debris due to a log jam forming at the weir. This leaves a situation where the gully is now full and the next time this happens the spoil and trees will just flow on down and the next choke point will be in amongst Stoke housing . As I understand it, Council may be liable for land it owns slipping onto private land. I have seen what this type of slipping/flooding does. This worries me greatly especially since a month ago we also clear-felled more of the forest that feeds into this gully.
2. The animal numbers of deer and possums are exceptionally high here due to the farmland, as this provides feed for both, allowing a high resident population . Animals will eat things they normally would not under two situations: when they are very hungry; when they are bored. Do not underestimate the latter. Shooting and poisoning are good ways to reduce populations but it is temporary and not a solution. If it were my job to shoot the rabbits on the farm and every year more were left that's called a "fail" in my world, yet that's what we do again and again. There are other ways.
3. Council own or have control of the entire catchment of Poormans Stream and Orphanage Stream right to the sea yet they are our most degraded streams. There is no reason this needs to continue other than lack of will.
4. The following recommendations were included in the set of "Supplementary Recommendations" submitted by the Task Force to the NCC CEO, for immediate attention and action, given their current situation post-harvest:
    a. Halt all harvesting…
    b. the spot spraying referred to in the above Weed Control table is for part of stand 42/05 located below the access road and on the opposite face up to the farmland boundary. It is a steep valley. This area was clear-felled in January 2022. A Spot Spray programme is envisaged in Spring 2023 and Autumn 2024.
    c. helicopter spraying is suggested for parts of 42/05 and 42/07 (19 hectares – excluding the area logged in 2023)
    d. with some severe weed and wilding *P. radiata* infestation, a potential for erosion, and part of the very visible landscape facing urban Stoke.
    e. the aim of spot spraying is to avoid a blanket vegetation kill (in parts that have some indigenous revegetation) and to provide an opportunity to plant this area over the next 8 - 9 months to beat the weeds that will remain between the spots.

Also,

- Fire must be taken into account when planning, we must try to mitigate this.
- Refer map following for stand identification (view larger maps here).



NCC Forest Stands - Marsden Valley Forest

Right Tree Right Place

Nelson City Council | Te Kaunihera o Whakatū

0 250 500 750 m

Scale 1:16,000

N

July 2023

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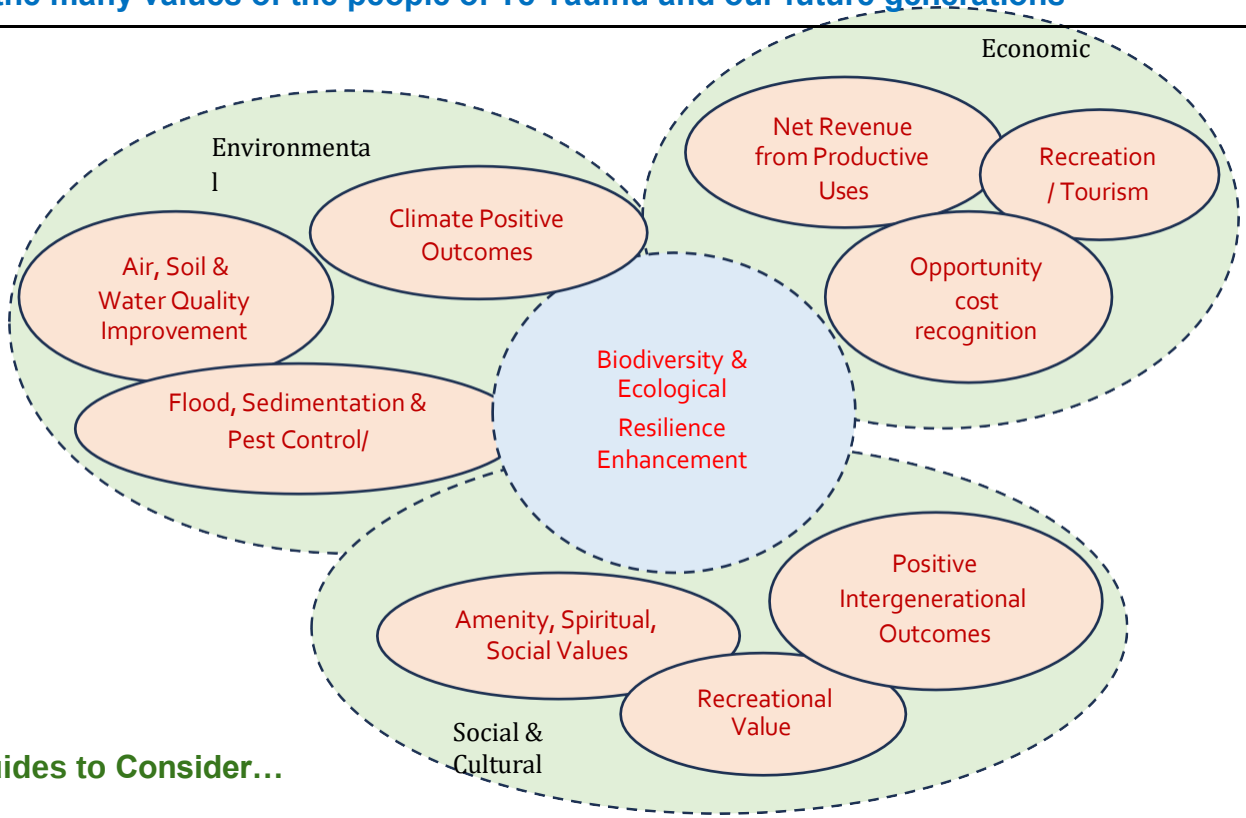

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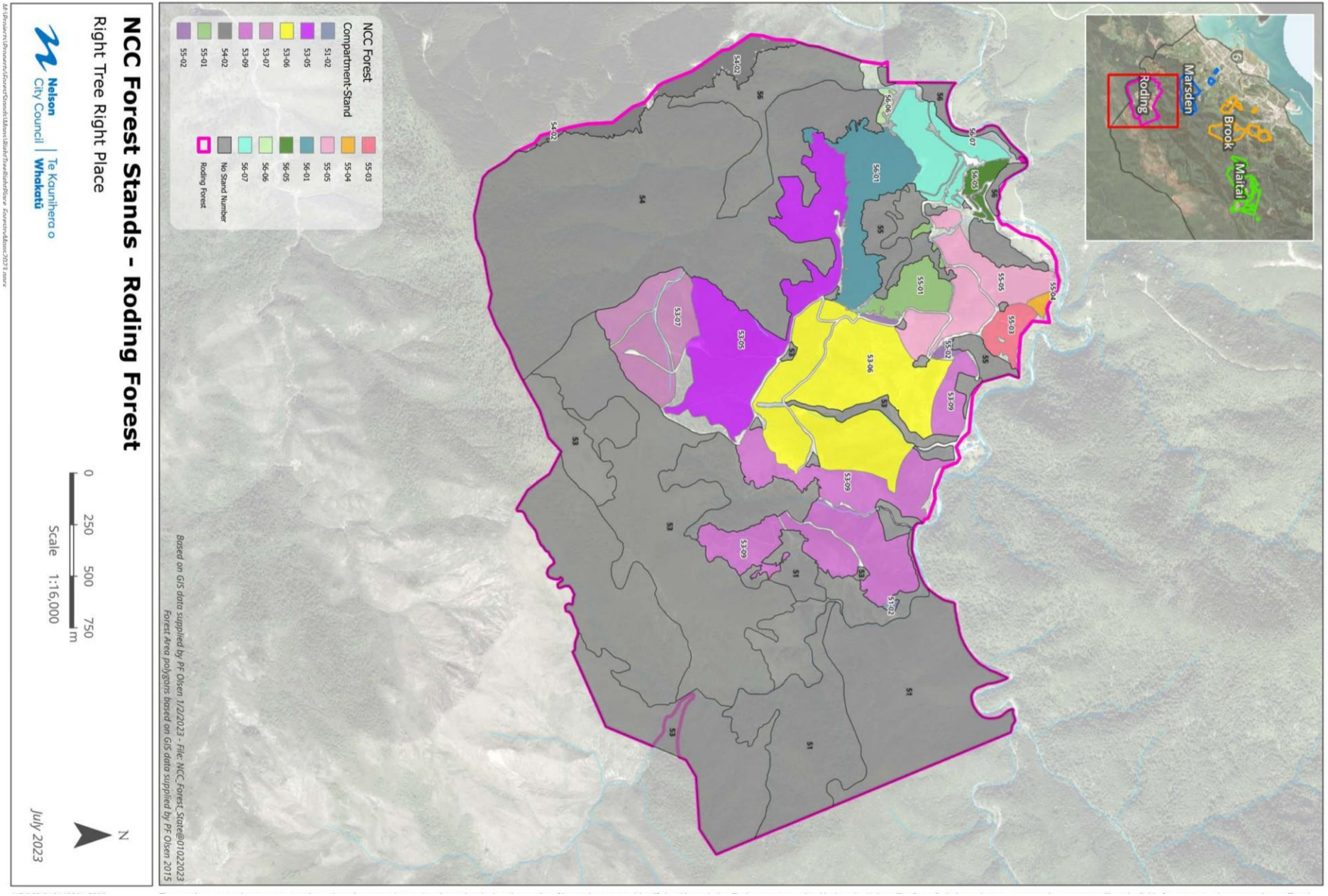
- Alternative revenue streams
- To perpetual community managed forests
- Governance structures that empower community/statutory organisations and partnerships and continuity of long-term goals and aspirations
- Forests with a wide range of species
- Forests that include some capacity for high value extraction of timbers while maintaining continuous canopies (think European models)

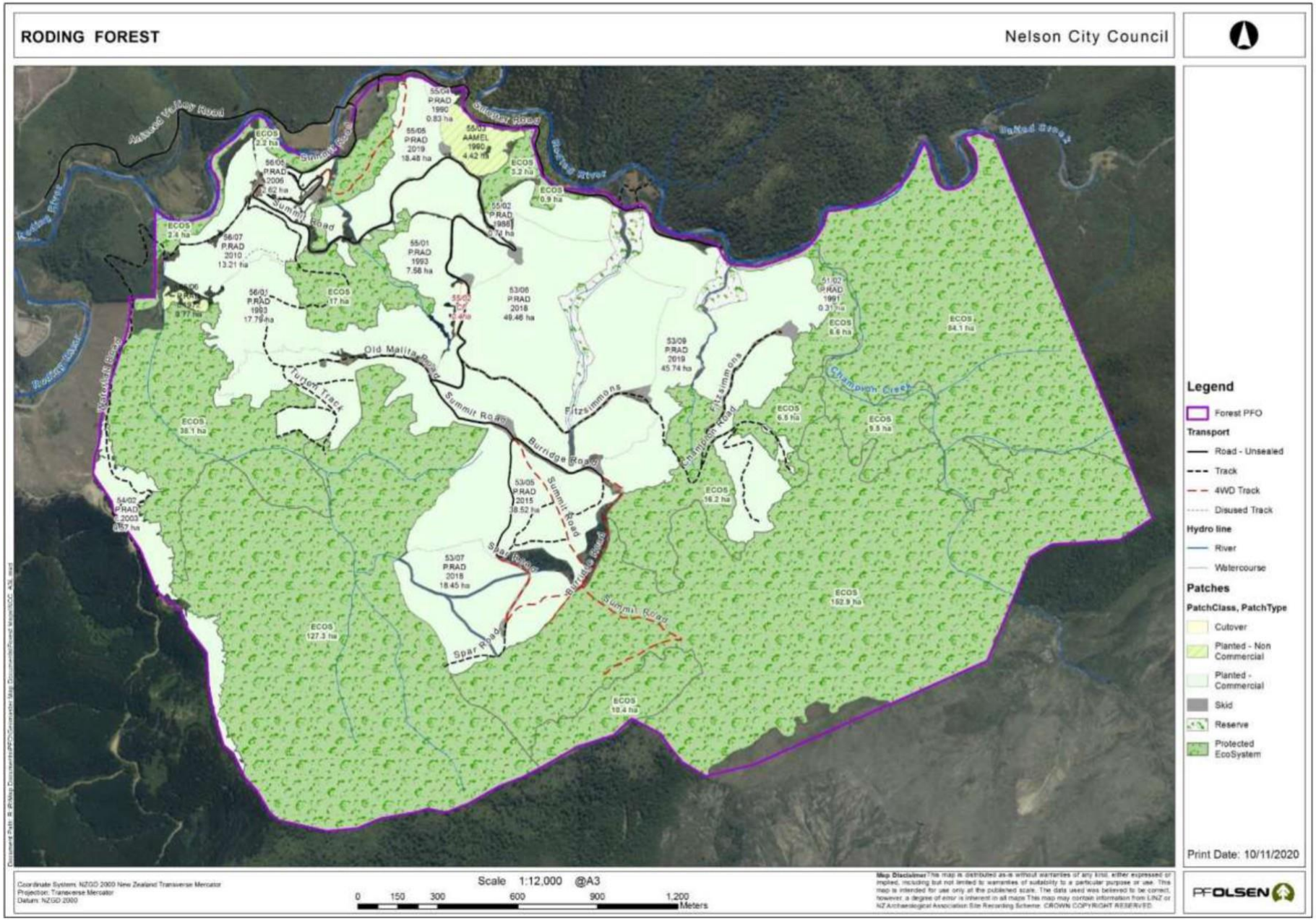
1. AN OVERVIEW OF THE FOREST AREA - MAPS

(view larger map here)

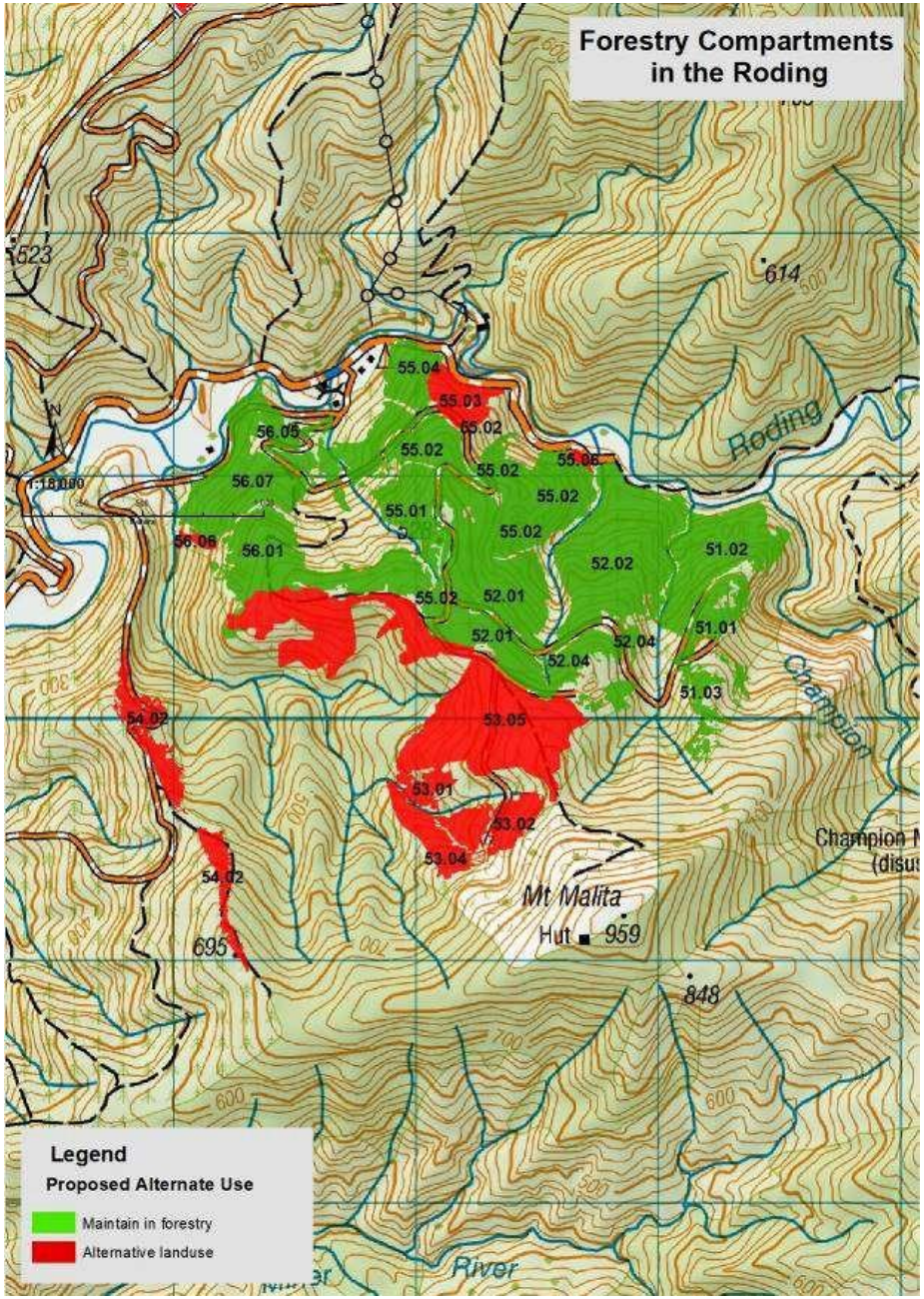
From NCC via Stuart Orme July 2023 (NB Stand identifiers change continually so this review only makes recommendations for stands shown in this map



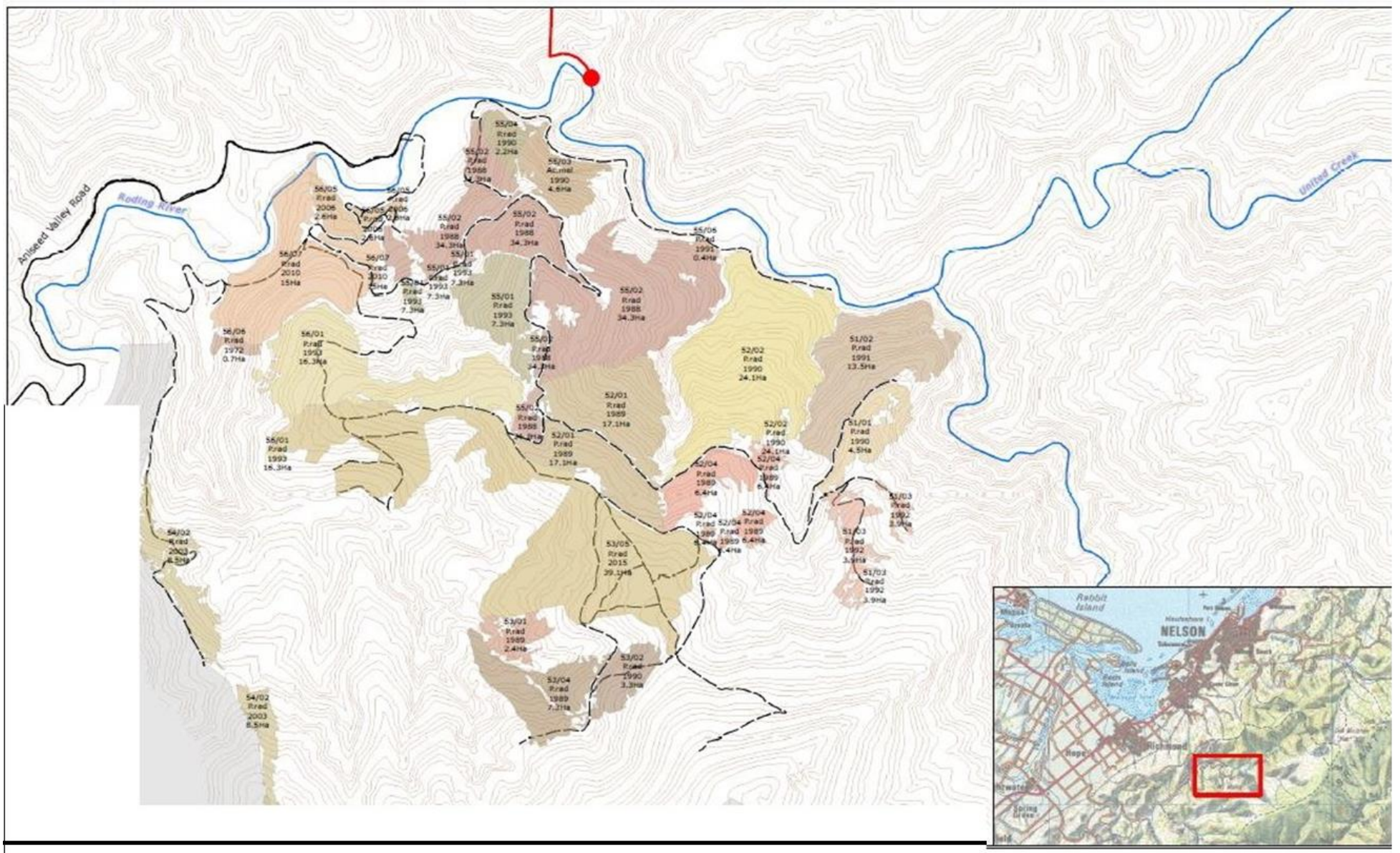
From PF Olsen NCC Forest Management Plan 2020-25 (PFOlsen, 2020)



From LandVision 2018 Report: NCC Forestry Alternative Land Management



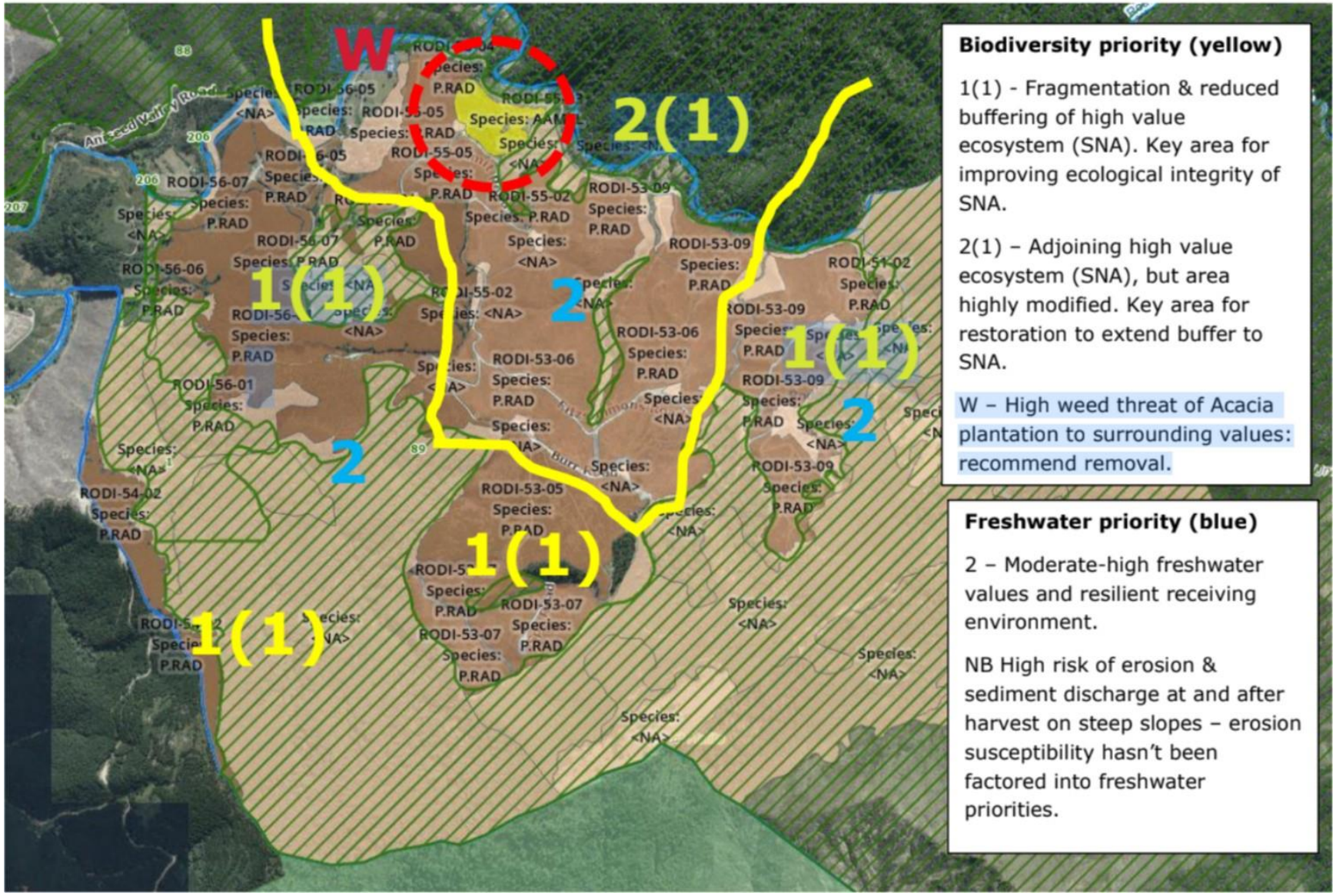
From Catalyst Report (2016)



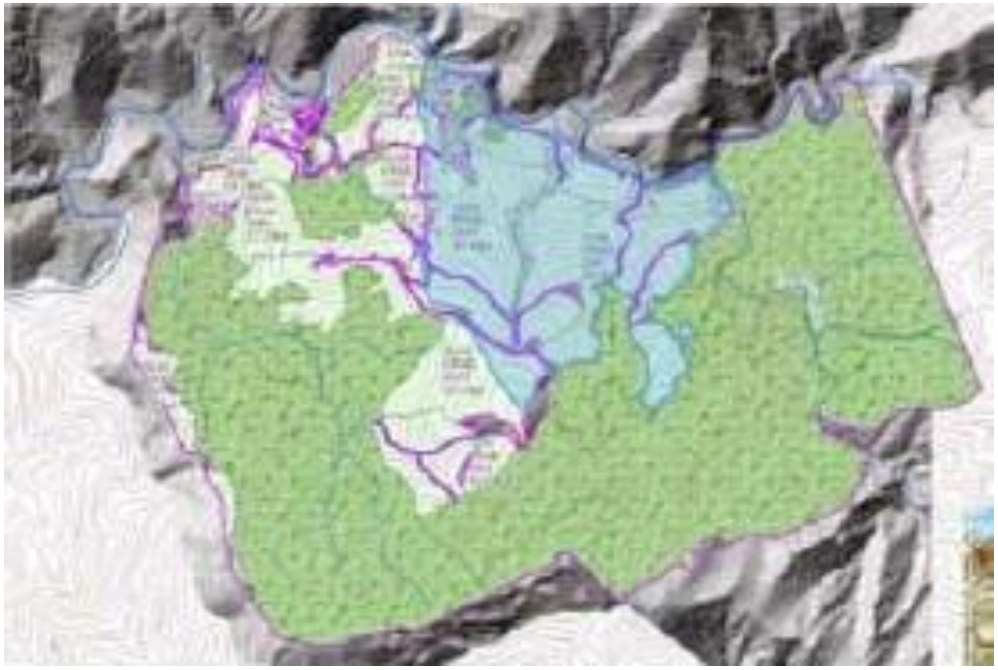
NCC Environment & Science Team Guidance/Priorities

(view larger maps here)

Roding stands – biodiversity and freshwater priorities



1. An Overview of the Forest Area - Description

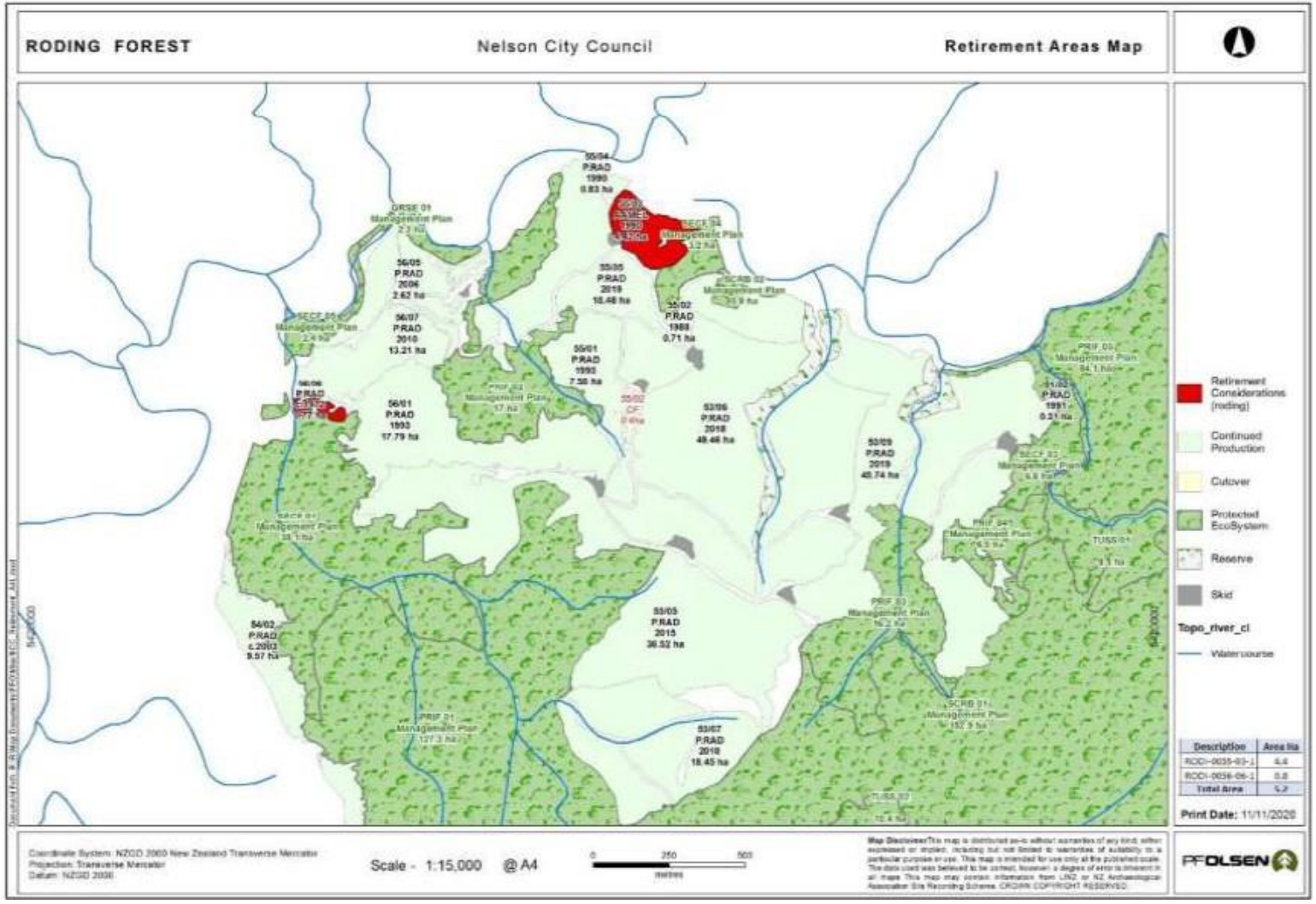
Background	Roding forest is located approximately 10km south of Nelson City Centre accessed via Aniseed Valley Road in Tasman District; the forests are on the eastern side of the public road up the Roding River beyond the Hacket carpark, but with occasional trampers visiting the old United and Champion chromite mines further NE. Internal forest roads and tracks are already established to provide access to all parts of the forest. Current harvesting is using cable harvesting systems due to the steep terrain. The initial 640 ha of forest land (of which Roding is a part) was purchased by Nelson City Council as a commercial investment and a means of protecting their water supplies from hazardous effects such as erosion and sediments. The four commercial forests all provide, in addition to timber generated incomes, various recreational opportunities whether they be mountain biking, hiking or general walking tracks (FMP 2020-2025). The Roding stands are bounded by Tasman Pine forest in the west (contiguous) and north (over the public road and running uphill to the Marsden forest boundary on the ridge), NCC and DOC land to the south and east. About 50% of the Roding forest catchment drains towards the Roding River upstream of the Roding River water supply intake which diverts water through a tunnel to Marsden Valley (see map below). 

History	The Roding water supply weir and tunnel dates back to 1941, diverting water through a 2.68km tunnel to Marsden Valley and supplying parts of Stoke-Tahuna and Richmond, with water now treated, with Maitai sourced water, at the Tantragee water treatment plant in the Brook. The Roding weir was raised by 1.5 metres in 1972. The NCC caretakers house is located just downstream of the weir. Chromite and copper exploratory mining further upstream but not within the current forest boundaries. Management: Up until 2014-2015, Council's forestry was internally overseen by the Environmental Reserves Supervisor, along with 10,000+ha of reserves. Management of the production forests contracted to PF Olsen.
Variety of landscape	*Climate*: Due to orographic influences, mean annual rainfall would be slightly higher (approximately 1,200 mm) than occurs at Nelson City or on the coastal faces of the Barnicoat Range. Rainfall would vary positively with the significant elevation differences across Roding Forest. *Geology and Soils:* Underlying geology is finely bedded sandstones and siltstones but generally very stable terrain. Forested terrain is steep hill country spanning an altitude ranging from 185 to c700m asl with the backdrop of Mt Malita at 959m. Soils are classed as orthic brown, moderately deep with clay subsoils but of lower fertility at altitude. *Erosion*: Most of the area of most of the forest is classified under the Land Resource Inventory as class 7e3 land4 with moderate to severe constraints upon pastoral use due to erosion. The main erosion types are moderate to severe sheet, soil slip, and scree. Under forestry regimes, these forms of erosion do not feature as major problems at harvesting due to the inherently relatively robust underlying geology, but care is required of earthworks. As such, under the Erosion Susceptibility Classification (ESC) used as a risk assessment base for regulation under the National Environmental Standard for Plantation Forests, the forests areas are generally classed as medium risk only. With the exception of a small band of forest land high on the slopes of Mt Malita (with a classification of High), the Erosion Susceptibility Classification (ESC) for the Roding forests is Moderate. *Ecology*: Falls within Bryant Ecological District. Forests generally contain mixed beech-podocarp, dominated by red beech, silver beech, the black beech-mountain beech complex and occasionally hard beech. Rimu, miro, matai and occasionally totara; tanekaha may be quite common in the sub-canopy. The FMP document states that most NCC forest areas would 'sustain a natural tree cover of Hard Beech with very scattered and low densities of rimu and other podocarps. Red beech would prevail in damper gullies. Scrub is generally in the lower altitudes and is generally manuka dominated. The forest has a convoluted boundary and is bounded to the north and east by native forest, most of which is SNA 89. The abundance of surrounding native forest and the presence of native forest patches embedded within the forest make the seed source context of excellent quality for diverse regeneration. Animal pest issues, especially ungulates, are problematic for forest health and for diverse native forest regeneration. Gorse regeneration is widespread across the clear-felled land regenerating from abundant gorse seed in the soil seed bank. *Land Use*: Of the 715ha of the Roding forest area, 484ha (68%) are reserves areas (Table 4, NCC FMP2020-2025) [or 491ha in Table 15] comprising 478ha terrestrial reserves and 7ha riparian, and less than 2% of which falls into any threatened environments classification of concern (Table 6 FMP).

Forestry futures	The Roding Forest is now exclusively Pinus Radiata as stand 55.03 (4.4ha) of Tasmanian Blackwood (Acacia Melanoxylon) beside the road above the caretaker's house was poisoned in 2018 (check this is same block that I saw on 24 July). The productivity index for the Roding Forest is marginally lower than for the other 3 NCC catchment blocks (Table 17 FMP). The only areas flagged for retirement/transition in the current management plan NCC FMP2020 (PF Olsen) map (see below) are stands 56.06 (0.7ha) and 55.03 (4.6ha). Bell's 2015 report recommended all areas except regen stand 54.02 (8.5 ha) for ongoing plantation in the Roding. The report noted that 125 ha planted between 1988 and 1993 would be ready for harvest during the period 2016 to 2021 (and currently being harvested). It also noted that the ford across the Roding Stream does present a barrier in wet weather, and this has now been replaced by an all-weather concrete bridge. It also stated that Roding Forest has been affected by windthrow in past years and some salvage operations have been carried out. The forest is used for water supply and there are strict conditions around the use of herbicides. Forbes recommends that the entire Roding Forest be transitioned to native under a passive regeneration approach (he also recommends transition to native for Maitai and Brook forests with some funding support for this from continuation of commercial forestry at Marsden). Bell report (2015) [and Catalyst (2016)] and Landvision (2021) recommendations by stand for Roding Forest: 51.01 {NOW PART OF 53.09} - 4.5 ha 1990 Rad harvest in 2018 replant to unpruned regime. [Harvest and replant] Maintain in forestry 51.02 {REDUCED TO AN UNHARVESTABLE 0.31HA REMNANT ON EAST SIDE OF RODING FOREST; REMAINDER NOW IN 53.09} – 13.5 ha 1991 Rad harvest in 2019 replant to unpruned regime. [Harvest and replant; maintain 200m buffer from Roding River] Maintain in forestry 51.03 {ABOVE 51.01 AND 51.02 NOW APPEARS TO BE PART OF 53.09}– 3.9 ha 1992 Rad harvest in 2020 replant to unpruned regime. [Harvest and replant] Maintain in forestry *52.01 {NOW PART OF 53.06} - 17ha [Harvest and replant] on Fitzsimmons Rd? Maintain in forestry* 52.02 {NOW PART OF 53.06 AND 53.09 WITH GULLIES TO RODING ON BOTH SIDES} – 24.1 ha 1990 Rad harvest in 2018 replant to unpruned regime. [Harvest and replant; maintain 200m buffer from Roding River] Maintain in forestry 52.04 {NOW MAINLY 53.06 AND A LITTLE IN 53.09} – 6.4 ha 1989 Rad harvest in 2017 replant to unpruned regime. [Harvest and replant] Maintain in forestry 53.01 {PART OF 53.07 BELOW MT MALITA AT SOUTHERN END OF RODING BLOCK} – 1.0 (2.4?) ha 1989 Rad harvest in 2017 replant to unpruned regime. [Harvest and replant; Convert to alternate use if seedlings fail] 2.4ha? Past wind (SE) and snow damage - Maintain in forestry unless current crop fails 53.02 {PART OF 53.07 BELOW MT MALITA AT SOUTHERN END OF RODING BLOCK} – 3.3 ha 1990 Rad harvest in 2018 replant to unpruned regime. [Harvest and replant; Convert to alternate use if seedlings fail] Past wind (SE) and snow damage - Maintain in forestry unless current crop fails 53.04 {PART OF 53.07 BELOW MT MALITA AT SOUTHERN END OF RODING BLOCK} – 7.0 (7.3?) ha 1989 Rad harvest in 2017 replant to unpruned regime. [Harvest and replant; Convert to alternate use if seedlings fail] 7.3ha? Past wind (SE) and snow damage - Maintain in forestry unless current crop fails cont…

Forestry futures cont…	*53.05 – 38.5 ha (39.1?) [Harvest and replant; Convert to alternate use if seedlings fail] Not mentioned in Bell report but shown in FMP2020 map. 39.1ha? Past wind (SE) and snow damage - Maintain in forestry unless current crop fails* 54.02 – 8.5 ha {NOW 9.6HA} 2003 Rad regen, harvest in 2031, revert to native (PFO response comments that reversion to native will require management intervention as mentioned previously). [Harvest via Tasman Pine adjacent and replant; Convert southern portion to alternate use] Natural regeneration of indigenous - will require wilding control as this block is already wilding pine 55.01 – 7.3 ha {now 7.58ha}1993 Rad harvest in 2021 replant to unpruned regime. [Harvest and replant] Maintain in forestry 55.02 {now mostly PART OF 55.05 AND 53.06, WEST SIDE OF GULLY DRAINING TO RODING; REMNANT 1.13HA} – 34.3 ha 1988 Rad harvest in 2016 replant to unpruned regime. [Harvest and replant; maintain 200m buffer from Roding River] Maintain in forestry *55.03 - 4.4 ha [Poison/fell to waste] Not mentioned in Bell report. Acacia poisoned 2018: Manuka afforestation for ETS commitments or Natural regeneration of indigenous species.* *55.04 - 0.8 ha [Harvest and replant] Not mentioned in Bell report but shown in FMP2020 map. Maintain in forestry* *55.06 {NOW NORTHERN PART OF 53.09} - 0.4 ha [Convert to alternate use] Not mentioned in Bell report. Natural regeneration of indigenous species, but PFO recommended continue in pine with adjacent 52.02* *56.01 - 17.8 ha [Harvest and replant] Not mentioned in Bell report but shown in FMP2020 map. Maintain in forestry* *56.04 - ?? ha [Harvest and replant] Not mentioned in Bell report nor Landvision 2021* *56.05 - 2.6 ha [Harvest and replant; Maintain 10m buffer around Roding River] Not mentioned in Bell report but shown in FMP2020 map. Maintain in forestry* *56.06 - 0.77 ha [Harvest and replant] Not mentioned in Bell report. Exotic species afforestation; harvest with 56.07 in 2038* *56.07 - 13.2 ha [Harvest and replant] Not mentioned in Bell report but shown in FMP2020 map. Maintain in forestry* cont…

Forestry futures cont…	Areas for Retirement in current NCC Forest Management Plan 2020-2025 (P F Olsen) = 55.03 + 56.06



Key Elements to Consider

Key Element for this Forest	Describe Current Situation	Risks? (& their likelihood)	Opportunities? (& their likelihood)
Water catchment	• Roding River water supply via weir above caretaker's house (approx half the forest land drains to the river above the weir)	• Sedimentation risks for Roding River, Waimea River and Waimea Inlet. Low-Med. • Fire risk affecting water supply catchment. Low-Med.	• Maintain aquatic ecosystem health and biodiversity. High.
Slopes/flats – topographical details – challenges – by compartment	• Largely contiguous stands. Moderately steep.	• Some erosion and harvest risk. Low.	• Area especially margins suitable for indigenous reforestation with adjacent native bush seed source. High.
Tourism & Recreation	• End of road limits regular uses • Historic chromite and copper mine walks attract some walkers upstream of forested areas; occasional walkers through the forest to Mt Malita • Tramping, walking and geologising	• Access impacted by forest harvest and fire risk closures. Moderate occurrence.	• Enhanced access for walkers and trampers. Moderate benefit. • Potential improved access to Te Araroa Trail connecting Rocks and Browning huts?
Cultural/amenity aspects	• Back country amenity values	• Opportunities to enhance amenity not realised. Low-med.	• Long-term geological history attraction, linked with Dun Mountain?
Harvest history – revenue, costs, known challenges	• Mostly economical to continue in production forestry. • Opportunity for revenue to subsidise transition costs in other forest catchments	• Some stands difficult to access. Low. • Erosion post-harvest. Low-med. • Wind and snow damage at higher elevations during SE winds. Med-high	• Some stands suitable for alternative exotic timber species. Med-high. • Some stands suitable for indigenous reforestation, but of lower priority than NCC front country forests. Low-med.
Pests – (plant & animal)	• Gorse, broom, old man's beard, wilding pines; ungulates	• Pests not managed. Financial and biodiversity costs. Med.	• Coordinated pest control with adjacent catchment landowners. Low likelihood.

Biodiversity	● High biodiversity value with Richmond Ranges and SNA 89 adjacent.	● Biodiversity outcomes limited by monoculture crop. Low-Med.	● More contiguous native a possible option, though neighbouring pines to west and south are likely to remain. Low-med opportunity due to cost.

Scenario Assessment

Forest Area assessed against these Values criteria. Note the scoring, 1-5, with 1 being low value/poor outcome, and 5 being high value/beneficial outcome.

1=low / 5=high	Transition / Continuation								
Value ➔ & Scenario ⬇	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (X of 40)**
Plantation Pine (clearfell management)	Known costs. Multi-spray then planting regime. Depends also on whether animal and wilding pine control costs are brought into this option (which reduces score below).	Windthrow risk at higher elevations. Some social licence risk. Some areas of poor establishment visible now on replanted areas. Fire risk.	Moderate returns expected. Refer Financial Considerations following. Management costs moderate. Refer Management Considerations following. No current ETS forests as all pre-1990.	Pine monoculture limits landscape amenity, but adjacent pine forest likely to continue.	Low tourism use at end of road - road access for walking and tramping occasionally affected by harvesting and due to fire risk. Increased fire risk w/climate change. Tramping, walking and geologising negatively impacted when public road access curtailed;public use of access via forest roads currently low.	Pine monoculture limits biodiversity, but more riparian and gully setbacks would help. Gorse and other weeds restrict native regen.	Moderately beneficial except during harvesting/ prior to subsequent canopy closure. Pine pollen seen as pollutant and irritant for some. Nutrient removal in harvest; soil compaction due to heavy equipment. Some in community oppose widespread herbicide use.	Flood control beneficial except during harvesting and in years after harvest. Pest plants not well managed in NCC production forests. Vector for infecting adjacent native forests. Potential sedimentation of waterways and marine environment during and after harvest.	
Score / Total	**4**	**3**	**4**	**2**	**3**	**2**	**3**	**3**	**24 / 40**
Alternative continuous cover and timber species (native and/or exotic)	Revenue from other exotics less certain but longer term and higher per m3. Depends also on whether animal and wilding pine control costs are brought into this option.	Potential better income from alternative exotics. Better tailor risk to stands Animal pest control Some wilding pine removal needed. Weed competition especially gorse. Fire risk Establishment failure risk	Timber revenue unrealised in medium term. Voluntary carbon and biodiversity market potential.	Positively impacts these values/ outcomes.	Permanent forests preferred. Economic return to the region from possible visitor interest in timber crops. Fewer forest closures due to longer rotation or selectively logged trees.	Permanent and selectively harvested forests mean significantly less habitat disturbance. Mixed tree species can enhance outcomes.	Enhanced outcomes due to longer rotation of selectively logged trees and remainder permanent forest.	Re-establishing canopy is key to mitigating risk on steep slopes - faster growing exotics could be nursery for slower natives Enhanced outcomes due to less soil disturbance but transition risks. Active pest management preferable.	
Score / Total	**3**	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**26 / 40**

	Transition / Continuation								
Value ➔ & Scenario ⬇	**Cost or Affordability**	**Risks**	**Net Revenue**	**Amenity, Spiritual, Social**	**Tourism & Recreation**	**Biodiversity Enhancement**	**Air, Soil & Water Quality Improvement**	**Flood, Sedimentation & Pest Control**	**Scenario Score (x out of 40)**
Mixed native & exotic amenity forest	No timber revenue but potential honey or other sources.. Depends also on whether animal and wilding pine control costs are brought into this option.	Better tailor risk to stands. Animal pest control. Some wilding pine removal needed. Weed competition especially gorse. Fire risk. Establishment failure risk.	Voluntary carbon and biodiversity market potential. Other income sources: lease for honey; external co-funding. Costs vs revenue significant for natives	Positively impacts these values/ outcomes. https://www.c40knowledgehub.org/s/article/Why-biodiversity-matters-for-cities-and-the-climate.	Exotic and permanent forests possible in the Roding. Economic return to the region at this location likely to be low. Enhanced access opportunities (though dependent on TDC maintenance of Aniseed valley public road).	Permanent forests mean significantly less habitat disturbance. Mixed tree species can enhance outcomes.	Permanent forests preferred. Enhanced outcomes. Long term carbon sequestration. But transition time has risks.	Re-establishing canopy is key to mitigating risk on steep slopes - faster growing exotics could be nursery for slower natives. Enhanced outcomes due to less soil disturbance but transition risks. Active pest management preferable.	
Score / Total	**2**	**4**	**2**	**3**	**3**	**4**	**4**	**3**	**25 / 40**
Native forest via natural regen (NR) and/or active planting (AP)	Higher transition costs, lower for NR than AP. (Roding is favourable to passive regeneration with supporting plant and animal pest control, according to Forbes 2022, but he estimates cost of 5-year animal and wilding control at $718740 for the entire 261.4 ha clear-fell, then $137214/annum)	Establishment failure risks. Weed competition especially gorse. Animal pest control required. Considerable wilding pine removal needed. Animal pest control would be required initially and in the long term. It is expected that gorse would establish widely (Forbes 2022)	Voluntary carbon and biodiversity market potential. Other income sources: lease for honey; external co-funding. Costs vs revenue significant for natives.	Positively impacts these values/ outcomes. Potentially greater value from kaitiakitanga perspective if all native species.	Enhanced outcomes. Economic return to the region at this location likely to be low. Enhanced access opportunities, eg. to Te Araroa Trail via Mt Malita, though dependent on TDC maintenance of Aniseed valley public road, and access through forest.	Significantly less habitat disturbance. Species can enhance indigenous biodiversity outcomes. https://www.nfrt.org.nz/the-facts/	Permanent forests preferred. Enhanced outcomes. Very long term carbon sequestration. But transition time has risks.	Enhanced outcomes due to less soil disturbance but transition risks. Active pest management preferable.	
Score / Total	**1**	**3**	**2**	**4**	**3**	**4**	**4**	**3**	**24 / 40**

FINANCIAL / NET REVENUE FROM PRODUCTION FORESTRY CONSIDERATIONS

PFO Market Value by Stand below (App 5),[1] lists stands being considered (by PF Olsen) for continuation in production forestry, with a total estimated harvest profit (stumpage) at 2023 totalling $7.39m from 217ha or $34,000/ha:

Forest	Stand	Planted Year	Yield Table	NSA (ha)	Age of Clearfell	Stumpage Value ($/ha)		$$
RODI	0051-02	1991	37137CF-LVL_S25	0.31	32	21,068		6,532
RODI	0053-05	2015	RODI-F500-LVL_S25	38.52	27	35,138		1,353,510
RODI	0053-06	2018	RODI-F500-LVL_S25	49.46	27	35,138		1,737,918
RODI	0053-07	2018	RODI-F500-LVL_S25	18.45	27	35,138		648,293
RODI	0053-09	2019	RODI-F500-LVL_S25	48.01	27	35,138		1,686,968
RODI	0054-02	2003	42048MR-LVL_S25	9.57	27	19,237		184,101
RODI	0055-01	1993	42049CF-LVL_S25	4.87	30	30,527		148,665
RODI	0055-02	1988	29676CF-LVL_S25	0.71	35	38,606		27,410
RODI	0055-04	1990	32870CF-LVL_S25	0.83	33	40,209		33,373
RODI	0055-05	2019	RODI-F500-LVL_S25	18.6	27	35,138		653,564
RODI	0056-01	1993	42271CF-LVL_S25	10.92	30	32,297		352,681
RODI	0056-05	2006	42051MR-LVL_S25	2.62	24	24,133		63,228
RODI	0056-06	1972	29833CF-LVL_S25	0.77	52	47,871		36,861
RODI	0056-07	2010	RODI-F500-LVL_S25	13.21	27	35,138		464,171
						TOTAL ESTIMATED 2022 VALUE		$7,390,744

[1] PF Olsen. (2022). NCC Tree Crop Valuation 2022. p.42.

STAND PHOTOGRAPHS

Clockwise from left (24 Jul 2023 - A Fenemor photos): Gully in stand 53-09; Poisoned blackwoods stand 55-03; Unharvestable remnant 51-02; Stand 53-06




Clockwise from left (30 Sep 2023 - A Fenemor photos): Grass and gorse between stand 53-07 and Mt Malita; Stand 53-06 view towards 55-05; gully draining 53-06 and 53-09 to Roding River; main access road from Roding caretaker's

Clockwise from left (30 Sep 2023 - A Fenemor photos): Roding caretaker’s house from stand 56-01; part harvested stand 56-01; poor riparian margin stand 56-05; Roding headwaters from stand 53-06 across 53-09




Clockwise from left (30 Sept2023 - A Fenemor photos): Stand 53-05 view to Mt Malita; stand 54-02 next to Tasman Pine viewed from stand 53-05; stand 56-01 towards 56-07; higher elevation stands 53-05 and 53-07

5.B - RODING CATCHMENT STAND-BY-STAND ASSESSMENT

For stand reference maps refer here.
NOTE: Ticks indicate initial relative preference. No ticks means not a preferred option – the more ticks there are, the more favoured this is.

Stand information per master list / 2023 Maps (PFO)					**Assessment against scenarios (all of which produce tall canopy forests)**				
Stand Number	Area (ha)	Value ($) / ha	Species	Year planted / estab-lished	**1) Plantation forestry** (pinus radiata) **Scenario (1A**) Transition post mature harvest **Scenario (1B)** Active transition pre maturity	**2) Alternative continuous cover timber species** (native and/or exotic)	**3) Mixed native and exotic amenity forest tree cover**	**(4) Native forest tree cover** via: **(P)** planting, or **(AR)** assisted regeneration, or **(PR)** passive regeneration	**Comments** NB. Refer appendix for further detail on specific values for each stand, species and year harvested. Code: PFO = PF Olsen UMo = Under management of Wildings = wilding pines
CURRENTLY CLEARED OR AWAITING TRANSITION ⬇									
RODI 56.01	17.8	0.35m	P Rad	1993	✓✓	✓✓✓	✓	✓	Mid ridge stand. Felled 2023; try replanting in 2024 to avoid long term fallow of land and gorse growth. Opportunity for accessible alternate species plantings here.
RODI 55.01	7.58	0.15m	P Rad	1993	✓✓	✓✓✓	✓	✓	West facing and steep. Felled 2023; try to get replanted in 2024 to avoid long term fallow of land and gorse growth. Opportunity for accessible alternate species plantings here.
RODI 55.02	1.13	0.03m	P Rad	1988	✓	✓✓✓	✓✓	✓	Remnant as too hard to log last time but could be harvested by pulling rope to nearby skid. Opportunity for accessible alternate species plantings here (redwood?).
RODI 55.03	4.42	0	Acacia mel			✓✓✓	✓	✓✓	Dead blackwood stems from 7 years ago, on north facing slope near river. Not all dead so needs further poisoning. Potential for alternate species or regen.

RODI 56.01	17.8	0.35m	P Rad	1993	✓✓	✓✓✓	✓	✓	Mid ridge stand. Felled 2023; try replanting in 2024 to avoid long term fallow of land and gorse growth. Opportunity for accessible alternate species plantings here.
5 stands	**48.7 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE WITHIN < 10 YEARS ⬇									
RODI 54.02	9.57	0.18m	P Rad	2003	✓✓✓		✓	✓✓	Western outlier unable to be easily harvested within NCC but possible via Tasman Pine adjacent. Could sell crop, sell land (if minimal transaction costs eg surveying) or harvest with neighbour. Native option would require wilding control.
RODI 55.04	0.83	0.33m	P Rad	1990	✓	✓✓	✓	✓✓✓	North facing ridge near river. Potential for alternate species or regen.
RODI 56.05	2.6	0.06m	P Rad	2006	✓✓	✓✓✓	✓	✓	North facing near river. Pruned and thinned stand but has regen pines in the riparian zone that should be removed. Potential for alternate species or regen.
RODI 56.06	0.77	0.03m	P Rad	1972				✓✓	Difficult access. Probably regen after harvest.
4 stands	**13.8 ha**								
STANDS HARVESTABLE OR TRANSITIONABLE BEYOND > 10 YEARS ⬇									
RODI 53.05	38.52	1.35m	P Rad	2015	1A ✓✓✓	✓✓	✓	✓	Replanted accessible and re-establishing well but at higher altitude. Continue in pine.
RODI 53.06	49.46	1.74m	P Rad	2018	1A ✓✓ 1B ✓✓	✓✓✓	✓	✓	North-facing but steep. Recently replanted. Bisected by roads. Opportunity for accessible alternate species plantings, either interplanted within current rotation or after harvest. Stand appears too large for single clearfell harvest.

RODI 53.07	18.45	0.65m	P Rad	2018	1A ✓✓ 1B ✓✓	✓	✓	✓✓✓	South facing and at upper elevation. Part contains the highest elevation block here. Potential for regen if windthrow occurs, or after harvest. Gorse and grass land band of limestone towards Mt Malita could be planted with native seed sources to encourage regeneration
RODI 53.09	45.74	1.69m	P Rad	2019	1A ✓✓ 1B ✓✓	✓✓✓	✓✓	✓✓✓	North-facing but steep. Some recently harvested, some replanted. Needs more native riparian buffer to foot of slope on east side, especially as above Roding water supply intake. Opportunity for accessible alternate species plantings in lower portion, either interplanted within current rotation or after harvest; upper remnants could be regen especially if found to have excessive wind risk.
RODI 55.05	18.6	0.65m	P Rad	2019	1A ✓✓ 1B ✓✓	✓✓✓	✓	✓	Very gorse filled but trees coming through. North facing bisected by roads. Opportunity for accessible alternate species plantings here.
RODI 56.07	13.21	0.46m	P Rad	2010	1A ✓✓	✓✓✓	✓	✓	North facing near river. Thinned, framing regime. Potential for alternate species after harvest.
6 stands	**184 ha**								
TRANSITION IN PROGRESS / OR TRANSITIONED ⬇									
Roding: none									
15 stands	**~ 246.48 ha in Roding Catchment**								

KEY OBSERVATIONS AND RECOMMENDATIONS FOR THE RODING CATCHMENT AND FOREST STANDS

- Because we are recommending that front-facing forests (i.e. those with a nearby city backdrop and multiple public use) should be priority for change to native (or, in places of suitable climate, soil and access, selected specialised alternative timber species), more distant forests such as Roding could remain in some plantation forestry, with options to either continue in pine, or convert to alternative timber species potentially trialled in Maitai and Brook.
- There is an opportunity for NCC to demonstrate good practice land management to deliver its water quality and river management objectives as a regional council, and to demonstrate what can be achieved with a mosaic approach to steep land management. For example, NCC alongside TDC who are already doing this with Kingsland Forest, could advocate for contiguous forest mosaics, and be a NZ leader in trialling specialised alternative timber species for local use (eg with groups like the Fine Wood Working group at Cable Bay and Appleton's Tree Nursery).Wider native riparian buffers are needed along the Roding River and in tributary gullies, especially above the Roding water supply intake
- There is potential for increased recreational use of the Roding Forest as an access route to the Te Araroa Trail and to the historic mining sites upstream
- Some stands are too large to be harvested all at once (e.g. a complete tributary may be cleared at once when it should be subdivided, where practical, to reduce risk of sedimentation especially above the Roding water supply weir and intake).
- An overall vision for the Roding Forest in the longer term is therefore to progress towards is one with native forested fire-resistant gullies, wider native riparian margins especially above the water supply, alternative mixed timber species in the lower more accessible stands, continued pine forest to the end of current rotations (when decisions on future land cover could be reviewed), regeneration of native bush along the current native forest margins, and replanting of native in the currently grass- reverting-to-gorse limestone band towards Mt Malita. This vision is supported by the now high quality roading infrastructure for future access throughout the block, and the potential for necessary weed and pest control to be led by a NCC/TDC Roding catchment group covering the wider catchment, including wilding eradication in the adjacent lands
- These recommendations reduce the areas proposed for continued pine forestry in the Catalyst, Bell and Landvision reviews because of the need for improved riparian protection and reduced fire risk (in the face of more climate extremes) and the opportunities for alternative timber and amenity species.
- Overall, the Roding Forest is suitable for continued pine forestry with smaller harvest sizes, greater riparian protection especially in all tributaries above the Roding water supply intake and along the river. Lower accessible slopes would suit alternate timber mixes for selective or coupe harvest, while upper parts of the forest more vulnerable to windthrow could be harvested then revert to native from nearby native forest seed sources.

Refer maps following for stand identification (view larger maps here).