

# Sustainable harvesting of native timber for the benefit of habitat health and biodiversity conservation

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## Abstract

A healthy native forest ecosystem can support a huge variety of biodiversity, but what constitutes a 'sustainable' ecosystem and how this is achieved is less certain. Similar to many new world countries, New Zealand has lost much of its native forest cover since the arrival of Europeans, but still has over 30 per cent of its land area in the public conservation estate. Ensuring sufficient resources to actively manage this large publicly-owned estate for the long-term benefit of biodiversity is an ongoing challenge.

This paper aims to identify the main drivers for biodiversity loss in the remaining native temperate forests and how various sustainable forest management (SFM) systems can be utilised to reverse habitat destruction and promote the conservation of indigenous species. Studies of 'new world' temperate zone native forests are used to compare successful SFM with the Department of Conservation's (DOC's) management of New Zealand's publicly-owned and highly protected indigenous forest estate.

Barriers to achieving 'global' best practice for habitat and biodiversity conservation in a New Zealand context are identified. Potential solutions to long-term sustainable management of New Zealand's publicly-owned indigenous forest estate are provided, with a focus the sustainable harvesting of native timber for revenue generation. Re-commencing sustainable harvesting of native timber for high-value uses could provide DOC with an additional income stream that could be targeted for pest control, improving forest ecosystem health and biodiversity for future generations.

## Introduction

Significant evidence exists to support that active and sustainable management of the world's remaining forests is necessary if both habitat and associated biodiversity loss are to be reversed. Allen et al. (1995) define biodiversity as 'the variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur.' A fundamental scientific reason for sustaining biodiversity is to sustain genetic variability (Bunnell, 2008). There are many other reasons for the continuing decline in native forest biodiversity and ecosystems:

- Habitat loss
- Poor ecosystem health

- An increasing fragmentation of remaining forested areas
- Invasive weeds
- Disease
- The devastating impact wrought by introduced pests and predators – these are defined as 'an invasive species that causes unwanted changes in native ecosystems.'

In heavily deforested temperate-latitude locations such as Western Australia, North America and British Columbia on the west coast of Canada, the importance of conserving 'indigenous' forest remnants and their ecosystems has been recognised and is supported by governments (Wilson & Memon, 2005). The words 'indigenous' and 'native' have the same meaning in this paper. Different SFM systems are used to ensure the forest's long-term economic viability while focusing on a high-value timber industry. A native timber industry generates significant revenues, some of which are invested back into conservation activities. Other benefits of SFM include carbon sequestration, local indigenous employment, tourism and preservation of biodiversity and local ecosystems (NRC, 2011).

In New Zealand a history of widespread, uncontrolled and destructive logging and clearing of native forests has resulted in rapid habitat loss and ecosystem degradation. Since the arrival of Māori around 1300 AD, and subsequently European settlers, this country's forest coverage has reduced from 82 to 24 per cent of total land mass. Causal factors include the unrestrained logging of ancient woodland for timber, the clear felling of large areas for agriculture and pasture land, and some habitat loss due to natural disturbance from events such as uncontrolled forest fires and volcanic eruptions (Miller et al., 2005).

Increasing public concern resulted in the first national park being established in the 1880s in the Tongariro Forest to promote the long-term survival of a relatively large area of native forest (Wilson & Memon, 2005). More recently, an ongoing public outcry about the continuing destruction resulted in the total cessation of timber harvesting on Crown lands by 2002 (Levack, 2006). Legislation has been enacted to protect indigenous forests. Under the Conservation Act 1987, any indigenous forests administered by DOC are managed primarily for protection and no 'taking of indigenous plants' is permitted. The Reserves Act 1977 states that, 'the trees and bush on any historic, scenic, nature or scientific reserve shall not be cut or destroyed.'

Today New Zealand's indigenous forest estate is estimated at 6.4 million hectares from a total land area of 27 million. Eighty per cent of this estate is in national parks and reserves and administered by DOC. These lands, while being highly protected, provide free and unlimited access to the general public. The remaining 20 per cent is privately owned by both indigenous Māori and New Zealand Europeans, Pakeha (Thorp, 1998; Wilson & Memon, 2005).

The other major threat to biodiversity is the destructive impact of introduced mammalian pests and predators. Introduced pests upset the ecosystem balance by over-browsing or selectively removing particular vegetation, preventing natural regeneration and species maturation. For example, this includes the devastation of New Zealand's native forests by possums, wild pigs, deer or goats. Note that each possum eats about half a kilogram of fresh foliage a night, equating to a population total of 30,000 tonnes nationwide (Thorp, 1998). Other introduced pests such as stoats, rats, mice, ferrets and feral cats are responsible for preying on native wildlife including nesting birds and their eggs. This includes arboreal rats and stoats in New Zealand (Thorp, 1998) and European red foxes in Australia.

In many countries the control of pests and predators is required over large areas and comes at a high cost in terms of financial resources. In New Zealand insufficient resources have resulted in large areas of the public forest estate being effectively unmanaged, thus allowing alien pests and predators to flourish, and it adversely impacting fragile forest ecosystems (Levack, 2006). A study by Gormley et al. (2012) showed the impact of invasive brushtail possums on New Zealand's indigenous forests, and concluded that while reducing the number is effective in decreasing tree mortality, regular control at frequent intervals of this species is required to maintain these benefits.

In many developed countries, conservation activities are performed by a number of public organisations and community volunteer groups and can provide a significant contribution to both biodiversity monitoring and habitat restoration. In the United States and Canada, the numbers of volunteers are increasing sharply due mainly to the rise in environmental enthusiasts. These volunteers have been shown to provide much needed support to conservation efforts. However in New Zealand some have argued that the increasing use of volunteers does not address the issue of field work, i.e. possum, stoat and rat control in remote or inaccessible areas where the skills and experience of professional DOC staff are considered irreplaceable.

The aim of this paper is therefore to identify: 'How can New Zealand's large publicly-owned forest estate be more effectively managed, with finite financial resources, for the long-term benefit of biodiversity conservation?'

## Size of NZ's problem

New Zealand's problem is significant: there are around 30 introduced mammals with wild or feral populations and about 2,800 known endangered species of fauna and flora. DOC is responsible for the protection of this country's threatened native wildlife on publicly-owned land, hence available resources are focused on protecting about 200 of these (DOC, 2013). The department spends about 20 per cent of its annual budget dollars on pest control. For example, the current management of possums on public conservation lands ranges from localised, intensive and continuous suppression to very low densities, to large-scale aerial poisoning operations at three to four-year intervals (Gormley et al., 2012).

DOC is responsible for the critical task of biodiversity inventory and monitoring to ensure limited resources are targeted at the priority areas and used effectively. New tools, such as the natural heritage management system (NHMS), and knowledge sharing mechanisms are being developed with communities, tangata whenau, research agencies, local and central government and others (DOC, 2013).

Monitoring has historically been locally based, but the development of a biodiversity monitoring and reporting system aims to provide a national picture of New Zealand's biodiversity and meet this country's national and international reporting requirements. Performance indicators such as dominance of exotic weeds and pests, mix of native plants, and animals are used to indicate ecological integrity. An ecosystem is considered to be healthy and have 'integrity' when it hosts all the native plants and animal types of the area and when ecological processes are functioning well (DOC, 2013).

Ironically, DOC continues to implement a national system to monitor and report on New Zealand's biodiversity across its managed estates in the face of budget cuts, job losses and the resultant loss of knowledge and skills. Anecdotal evidence suggests that DOC will never have sufficient money or resources to reverse the continual loss of biodiversity and sustainably manage the whole public forest conservation estate using current methodologies (Thorp, 1998; Levack, 2006).

## Sustainable forest management

Ecologically, SFM is a management system that seeks to sustain ecosystem integrity while continuing to provide ongoing social and economic benefits to the community. These benefits include sustainable access to wood and non-wood forest resources and enjoyment of other forest values. Commercial forestry and forest products research is considered an investment in the future of the timber harvesting industry providing opportunities for continuous improvements in forest management and utilisation.

In a successful transition from clear cutting or felling of coastal forests, the Canadian forestry company MacMillan Bloedel introduced in British Columbia in 1998 a 'variable retention system' as an appropriate harvest practice. Variable retention allows for the sustaining of 'other forest values' including the entire range of biodiversity (Bunnell, 2008). Three zones were designated:

- A timber zone (65 per cent of total) – for primary timber production with five to 10 per cent retention for conservation
- A habitat zone – with no more than 70 per cent available for harvest
- An old growth zone – where relatively little wood is removed to ensure the survival of some poorly understood animal species that may completely disappear from the 'productive' timber zone.

This particular management system introduced additional costs, about \$4 per cubic metre, but was sustained by high-grade timber sales (Bunnell, 2008).

Australia's government has developed its own set of criteria and indicators for SFM based on the Montreal Process framework. The introduction of systematic science-based forestry in Western Australia in 1916 was predicated on the permanent preservation of state forests and the establishment of plantations to replace imports of softwoods. Australia's Forests Products Commission (FPC) promotes that Western Australia's (unique) native timbers should be used for high-value products, and where possible incorporate maximum local processing to the financial benefit of those living in the state.

Surveys of Australia's southwest forests' flora and fauna have demonstrated how ongoing pest control can result in significant benefits for forest biodiversity. The devastating effects that feral animals have on native fauna are well recognised. However a study in Western Australia states that there had been a dramatic increase in native animals, with no recorded extinctions of any plant or animal species as a consequence of 'timber harvesting' during the last 30 years.

To ensure public support and provide transparency, harvesting quotas are required to meet sawlog and other timber supply requirements and are set annually after broad community consultation in line with the 10-year Forest Management Plan (FMP). More than 8.9 million hectares of native multi-use forests and plantations have been certified under the Australian Forest Certification Scheme and over 0.5 million hectares certified to the Forest Stewardship Council (FSC) standard. The Tasmanian government required non-clear felling in a minimum of 80 per cent of its old growth harvest by 2010, with aggregated retention (i.e. retention of 30 per cent of the coupe area) being the preferred method (Neyland et al., 2012).

The New Zealand government rejected multiple uses for its state-owned forests in the 1980s. To satisfy

both domestic and export timber markets exotic plantation forests were established in the 1920s, resulting in a plantation forest estate of around 1.8 million hectares, comprising *Pinus radiata* (90 per cent) and Douglas fir (seven per cent) (Wilson & Memon, 2005). Over recent years the focus on environmental issues (such as carbon storage, biodiversity and water yields) and an increasing 'sustainability' requirement on international trade in forest products, has driven increasing adoption of forest certification schemes like the Forest Stewardship Council and the Programme for Endorsement of Forest Certification Schemes (PEFC) (Allen et al., 1995).

The international Forest Stewardship Council certification scheme is the preferred choice for New Zealand's forestry sector. It requires the active conservation of native remnants and threatened species throughout the entire forest estate along with biodiversity monitoring programmes. Certification to date has been limited to exotic plantations due to the nature of the timber industry in New Zealand. The active management of plantation forests in this country shows that the ongoing development cycle of the forest and resulting disturbances (such as harvesting, site preparation, crop felling and thinning, silviculture manipulation) can have a positive effect on biodiversity (Allen et al., 1995).

Other conservation methods such as adaptive forest management – defined as 'the systematic acquisition and application of reliable information on which to make management decisions in the face of many uncertainties' – have been suggested as being more effective for complex systems which include threatened species, weed, and habitat and ecosystem management.

## NZ's indigenous forestry industry

In this country there is a clear distinction between the management of 'productive' plantation forests and the 'non-productive' highly protected indigenous forest estates – globally around 90 per cent of wood production comes from native forests (Wilson & Memon, 2005). It could be considered that the real value of New Zealand's indigenous forest is not financial, but lies in its non-consumptive uses such as soil and water enhancement, amenity provision, spiritual and visual values and perhaps most importantly biodiversity conservation (Thorpe, 1998).

In New Zealand, with major native timber sources situated in reserves, less than 0.5 per cent of total wood production comes from native forest (Devoe & Olson, 2001). The SFM of indigenous forests in this country for timber production is confined to privately-owned forests (Devoe & Olson, 2001), with approximately 25,000 cubic metres harvested annually to provide timber for high-quality furniture and finishing products, mainly of podocarps like rimu and tawa, beech and other hardwoods. According to Griffiths (n.d.), while the indigenous timber sector in New Zealand is very small it is an important supplier of top-end decorative

and special built timbers that contributed an estimated \$269 million to the domestic economy in 2010.

SFM permits are limited to a 10-year term and the more practical option for the landowner who does not wish to manage the forest for timber on a longer-term basis (Griffiths, n.d.).

The potential adverse effects on biodiversity from land preparation and mechanical harvesting of timber can be mitigated through active forest management such as providing nest site exclusion zones and reduced disturbance periods. Studies have shown that low toxicity herbicides used to protect other bird species had no discernable effect on falcon productivity.

The use of sustainably managed native timbers can reduce dependency on imported hardwoods, often harvested from unsustainable sources where the impacts on biodiversity can be serious (Devoe & Olson, 2001; Levack, 2006). However, New Zealand indigenous forestry struggles to build and maintain an image as a legitimate and sustainable industry based on renewable natural resources for these reasons:

- Historical legacy of forest exploitation
- The industry attracts its share of unscrupulous operators
- Plantation forestry negativity towards indigenous forestry
- Difficulty in shifting forest owners from being timber managers to ecosystem managers.

Nevertheless public acceptance could be fostered through a commitment to SFM by gaining Forest Stewardship Council or equivalent certification, investment in the forest for the future, an increase in levels of compliance monitoring, and the provision of information and guidance to raise public awareness.

The harvesting of native timber on public estates is currently prohibited, but DOC operates a system of concessions to manage commercial activities on conservation land such as sheep grazing and commercial hunting of wild animals, with the proviso that conservation values are protected. Advantages from these activities are weed and fire control benefits from grazing, concession fees supporting management of resources, and job provision for local communities and the national economy.

DOC recognises that it needs to generate future income by becoming more business-oriented and exploiting more tendering opportunities. According to a recent media release, the proposed restructuring of the department is necessary to meet the conservation challenges that New Zealand faces and to prepare it to work more effectively with external partners.

## Discussion and conclusions

In 2002, the legacy of New Zealand's unsustainable and environmentally damaging forestry practices

resulted in a total cessation of native timber harvesting on publicly-owned land. In addition there was a clear separation between the management of productive exotic plantation forests and the non-productive highly protected indigenous forest estate. It was identified that sustainable management of indigenous forest ecosystems relies on securing adequate funding. Unfortunately government budgets are becoming increasingly stretched, none more so than New Zealand.

However case studies suggest that indigenous forestry is economically and environmentally sustainable in other new world countries such as North America, Canada and Australia. In these countries active forest management is considered principally as an economic venture that provides indirect benefits for biodiversity, carbon sequestration, improved soil and water quality, tourism and recreation, as well as satisfying cultural values. Sustainable harvesting of trees for timber, supported through internationally accepted forest certification schemes, ensures that forestry managers have the means to re-invest in the forest's future survival. Reconciling the conflicting management goals of conservation and harvest is an ongoing dilemma in biodiversity management.

With investment, replication opportunities exist for the active sustainable management of New Zealand's indigenous forests that incorporates a wide spectrum of economic, ecological and social elements. Protection of ecosystems using pest control to maintain native bird and other populations requires significant investment as a lack of funding results in ecosystem deterioration. Forest management, whether for recreation, tourism, timber production or other uses, can generate additional income streams that can finance investment in habitat health and conservation initiatives.

The forestry sector stands to gain from implementing environmentally sustainable forestry management practices from the positive effects of forestry on biodiversity. There are substantial environmental, societal and economic benefits from SFM of indigenous forests (Devoe & Olson, 2001) such as providing:

- Something that is 'purely New Zealand', which is unique and culturally significant
- Forest enhancement through active management, including regeneration and restocking of canopy and other plant species
- Revenue to protect forests from predators and pests
- Market supply of attractive high-quality timbers for high-end uses like furniture and finishing timbers
- Recreational activities and visitor access.

Sustainable management focused on limited, but high-value, native timber harvesting is one means of securing additional funding to achieve conservation objectives.

The control of pests and predators together with the maintenance of forest productivity, soils, water quality, natural and amenity values can be achieved if the forests are financially self-sustaining through permitting revenue-generating activities. This model could be applied in a controlled manner by DOC in indigenous forests through the established consenting process, generating funds for increased pest control and habitat conservation. Certification schemes would provide clear evidence of the environmental sustainability credentials of a particular forest management scheme governance.

This paper has considered the application of ecological SFM to New Zealand's publicly-owned indigenous forests and considered, 'How can New Zealand's large publicly-owned forest estate be more effectively managed, with finite financial resources, for the long-term benefit of biodiversity conservation?'

In conclusion, New Zealand has an opportunity to promote an indigenous forestry industry by adopting ecosystem management principles and re-investing in the forest for positive environmental benefits using DOC. Expanding the indigenous forestry industry could provide benefits to the domestic economy, in particular through:

- Reinstating the sustainable harvesting of state-owned indigenous forests to produce certified timber
- Mandatory sustainability certification of imported timber and wood products
- Monitoring forest ecosystems to ensure the performance of sustainable practices
- Raising public awareness of the benefits of SFM and certification schemes
- Investing in SFM of indigenous forestry for the long term.

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