

Zealand Government in responding to the Convention on Biological Diversity by providing research effort, policy support and information on operational processes which facil-

itate the maintenance and enhancement of biodiversity in New Zealand forests under our management.

6.0 In addition, Institute members shall encourage all forestry sector partici-

pants to support and facilitate the identification of biodiversity indicators and ways to manage natural resources so that biodiversity in New Zealand is enhanced and maintained.

Biodiversity in New Zealand Plantation Forestry – an Industry Perspective

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Abstract

New Zealand plantation forests are not biological deserts and can support considerable biodiversity in their understoreys. More importantly, as signatories to both the New Zealand Forest Accord and the Principles for Commercial Plantation Forest Management in New Zealand, most forest managers are committed to the conservation of indigenous biodiversity in reserve areas and to the conservation of threatened species that are known to occur in their plantation forests.

Introduction

New Zealand's plantation forests provide multiple values including protection of water and soil resources, carbon sequestration, amenity, as well as wood production. They also can contain a perhaps surprisingly high level of biodiversity of both indigenous and exotic species, both terrestrial and aquatic (Allen 1995a, Ogden 1997, Rowe 1996). However, is this biodiversity important, and should it be deliberately managed? This paper presents a plantation forest industry perspective on biodiversity and the role of plantation forest management in conserving New Zealand's unique indigenous biodiversity for future generations. The view presented draws heavily on the underlying intent of the Principles for Commercial Plantation Forest Management in New Zealand.

New Zealand Forestry

The fact that plantation forestry makes a major contribution to New Zealand's economy (11.8% export earnings, 5.3% GDP) is well known (NZFOA 1997). It does this through the production and processing of 16.8 million m³ of plantation-grown wood from less than 6% (1.54 million ha) of the country's land area. As a comparison, less than 100,000 m³ of wood is produced from New Zealand's natural forest, which comprises 24% of the land area. The economic importance of plantation forestry will become even greater as the existing forests mature and more pasture is planted.

New Zealand's indigenous biodiversity resides primarily in the country's remaining natural areas, primarily forest. However, only one-third of the country's original natural forest area that was present before Maori and European settlement began exists today. While we may bemoan the loss of much of our natural heritage, New Zealand is fortunate, and also somewhat unique, in having been able to set aside virtually all its remaining natural forest for conservation purposes. Both food and fibre (including wood) are produced from "farms".

The advantages of producing wood from an intensively managed plantation forest versus harvesting natural, unmanaged forests are similar to producing agricultural crops on farms rather

than gathering food from natural ecosystems. Just as it is impossible to support the world's 5.5 billion people without intensive agriculture, it will become increasingly impossible to meet world demand for wood and fibre products without greater reliance on intensively-managed planted forests. However, despite their obvious commercial significance, in comparison to conventional agricultural crops, plantation forests are expected to provide a greater level of environmental benefits. They do this by protecting soil and water values, and by providing social benefits such as recreation and hunting. They also provide a greater level of biodiversity than agricultural crops.

The Forest Accord and the Principles

New Zealand forestry is also unique in having signed a number of very important environmental agreements with the country's major conservation groups. These were very significant milestones for both the conservation of biodiversity and a commitment to sustainable forest management. The New Zealand Forest Accord was signed in August 1991 and the Principles for Commercial Plantation Forest Management in New Zealand was signed in December 1995. The majority of New Zealand's forestry companies are signatories to these documents through the New Zealand Forest Owners' Association. Signatories to the Principles also include the New Zealand Farm Forestry Association Inc., Royal Forest and Bird Protection Society of New Zealand Inc., World Wide Fund for Nature New Zealand, Federated Mountain Clubs of New Zealand Inc., and Maruia Society Inc.

The Forest Accord distinguishes between natural and plantation forestry and recognises the important heritage value of the remaining natural forest and the value of commercial plantation forests as an essential source of renewable fibre. It also acknowledges that the existing area of natural indigenous forest should be maintained and enhanced and that plantation forests should not replace natural forest and other natural areas. While the Forest Accord does not exclude signatories from extracting wood from the remaining natural forest on a sustainable basis, the current harvest from natural forests is very small and declining.

The Principles for Commercial Plantation Forest Management in New Zealand were developed to promote understanding between the signatory parties with a view to New Zealand achieving environmental excellence in plantation forest management and participating as an effective advocate internationally for the sustainable management of plantation forests and the protection, preservation, and sustainable management of natural forests. The Principles recognise the interdependence of ecological, economic, and social sustainability and acknowledge that plantation forests were established for commercial purposes. However, they also recognise the contribution that plantation managers can make to protecting environmental values and to sustainable land use.

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Plantation forestry and biodiversity

What is biodiversity and why is it important? Biodiversity, or "biological diversity" as defined in the "Convention on Biological Diversity" (UNEP 1994), "means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems".

There are a number of reasons why the conservation of biodiversity is considered to be important, but at an international level it's mainly because of concern over protection of species and ecosystems, and maintaining genetic resources, that biodiversity has received such wide attention. Biodiversity is also considered to be important because of its contribution to overall environmental quality.

There is substantial evidence that New Zealand's plantation forests benefit biodiversity. Perhaps the most obvious benefit, and one that is clearly recognised by New Zealand's conservation organisations when they signed the New Zealand Forest Accord, is that by providing an alternative source of wood supply, plantations have enabled the remaining natural forest estate to be conserved.

Plantation forest owners have made a further commitment, beyond that made by signing the Forest Accord, to the conservation of indigenous biodiversity by committing to the Principles for Commercial Plantation Forest Management in New Zealand. During the development of the Principles there was considerable discussion over the issue of biodiversity and what role plantation managers should have in protecting New Zealand's biodiversity values. The signatory parties agreed that what was most important was the conservation of indigenous ecosystems, which could only be realised in a natural environment. Because plantation species were exotic and intensively managed, it was considered impossible to provide for indigenous ecosystems on the same piece of ground that was supporting exotic pine trees or other plantation species. However, it was also recognised that indigenous biodiversity could be maintained, and even enhanced, in areas within plantation estates including indigenous vegetation reserves, along stream margins, and also within aquatic systems within the plantation forests. The actual wording in the Principles states that "*indigenous biodiversity will be protected primarily in natural areas*" and that "*the protection of indigenous biodiversity in plantation forests is not the primary objective but should be recognised and provided for where appropriate*".

It was agreed in the Principles that "*managers shall take all practical steps to protect indigenous vegetation along the margins of water bodies where appropriate*" and "*to safeguard des-*

ignated reserved natural areas within or adjoining plantation forest boundaries from any adverse effects of forest operations". Terms such as "practical" and "where appropriate" were specifically included in these statements to recognise that it wouldn't always be possible to avoid damage to streamside vegetation and reserves, particularly during harvesting operations, and that factors of worker safety and economics also needed to be considered. It was also implicit in the development of the Principles that while it was desirable to protect indigenous vegetation reserves and stream margins, it was not reasonable to expect plantation owners to expand the level of indigenous vegetation in their holdings. The commitment to conserve natural forest was previously made in signing the Forest Accord.

There is also agreement in the Principles that "*where threatened species are known to occur within plantation forests and their presence is considered significant by the Department of Conservation, plantation managers shall consult with the Department of Conservation with the objective of conserving the population*". Threatened species are not common in plantation forests but the commitment is there to protect significant populations where they do occur. Kiwis, for example, are known to inhabit plantation forests on the Coromandel Peninsula and Northland, and managers are expected to take steps to maintain species numbers. In the case of kiwis, the most important steps that managers can take are to control predator populations and restrict dog access.

The Principles clearly recognise that plantation forests are established primarily for wood production. However, they also acknowledge the role that plantation managers can play in maintaining indigenous biodiversity in reserve areas and along margins of water bodies and in the conservation of threatened species inhabiting plantation forests.

Understorey biodiversity

Although it's New Zealand's natural forests where we expect to find the most biodiversity, radiata pine plantations are not "biological deserts" but in fact contain a large variety of understorey plant species (Allen 1995a,b, Ogden 1997). The composition of understoreys is very dependent on the geographic location of the forest and on the stage of plantation development. For example, new plantings on coastal sands will likely only have a very few species present, whereas forests on the central volcanic plateau may have rich understoreys of both exotic and indigenous species. In recently planted radiata pine in Kinleith Forest, Allen *et al.* (1995a) found up to 35 vascular plant species, 67% of which were indigenous. They also found that the proportion of indigenous species present in the understorey increased with time from planting to 82% in a 29-year-old stand. This level of species richness was greater than for many natural New Zealand forests (Allen *et al.* 1995b). Ogden *et al.* (1997) reported similar results from another Kinleith Forest study. The more recent study included a 67-year-old radiata pine forest, which had a fern understorey structure similar to that of native podocarp and kauri forests.

Current new land planting rates of 80,000 ha per annum is driven by expectations of greater financial returns from plantation forestry than from sheep farming however; this land use conversion will also provide considerable environmental benefits (Maclaren 1996). As well as improving water quality and reducing erosion rates, planting pasture land will also increase biodiversity by providing additional structure in crop trees and understorey plants.

Conclusion

The bottom line for plantation forestry in New Zealand is that radiata pine and other exotic species are grown as a commercial crop. If plantation forestry isn't economical then the land will be used for other productive purposes, such as pasture production. New Zealand forestry doesn't have the luxury of subsidies for



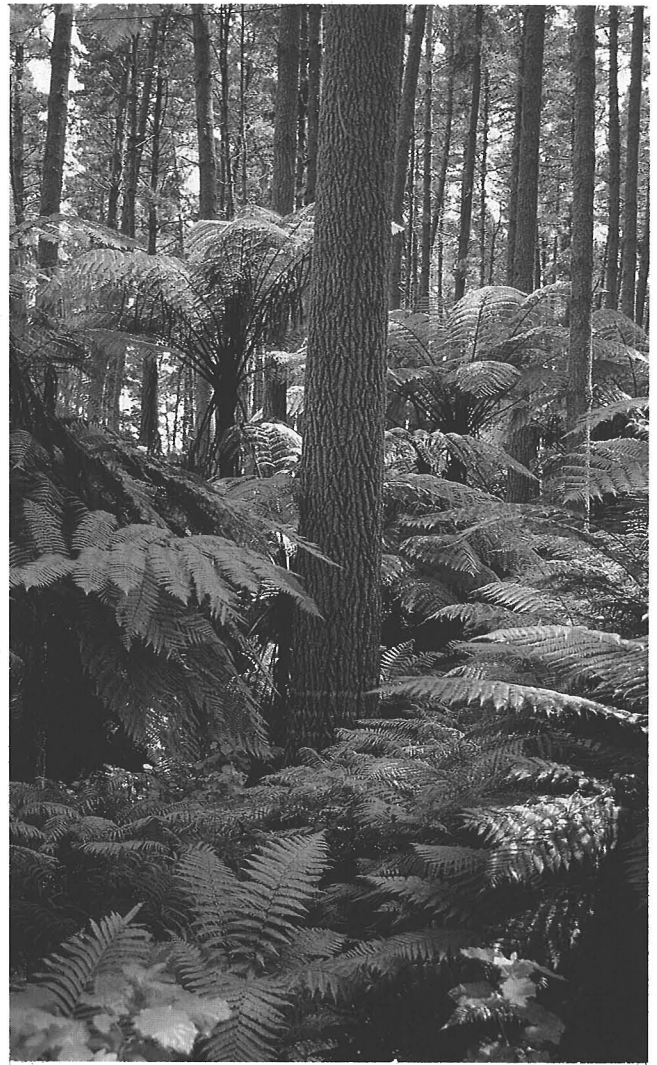
Root of a plant in a log in Kaiangaroa Forest.

supporting biodiversity in plantation forest management as do other countries such as Britain. There, private landowners have grants available to them that allow up to 20% of their land to be left unplanted and managed as open ground for biodiversity values (Hodge *et al.* unpublished report).

Despite the fact that New Zealand plantation forests are not managed specifically for biodiversity they can support a significant number of species in their understoreys. The importance of this biodiversity to crop production is not clear; however, it likely does contribute to an intangible level of environmental quality not present in densely-stocked plantation forests found in the other countries. Perhaps more importantly as far as the conservation of New Zealand's indigenous biodiversity is concerned, most plantation managers are committed, through the Forest Accord and the Principles, to the conservation of indigenous biodiversity in natural reserve areas and to the conservation of threatened species known to occur in their plantations.

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Understorey biodiversity.

Biogeography and Forest Biodiversity in New Zealand

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Abstract

*The concept of biodiversity is scale dependent. Biogeography is concerned mainly with explaining the larger scale patterns – the origins of the New Zealand flora and the regional patterns of biodiversity within the country (gamma-diversity). Geological and climatic history are important at these scales. Altitudinal gradients illustrate variation at the landscape level (beta-diversity). The conservation of landscape processes is important for maintaining high biodiversity and ecosystem 'services'. Ecologists cannot yet explain differences in diversity at the community scale (alpha-diversity), but arguably the disturbance regime is a key factor. A case study, comparing kauri (*Agathis australis*) and beech (*Nothofagus solandri*) forests, is outlined. If the indigenous conservation strategy, and operational exotic forestry, are to emphasise the sustainability of indigenous biodiversity, then the spatial and temporal scale effects which determine it must be explicitly addressed.*

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Introduction

The development of a New Zealand Biodiversity Strategy by the NZIF indicates our concern about the potential loss of some of our indigenous biodiversity, and an acceptance of our international obligations under the 1992 Biodiversity Convention. We should be particularly concerned about the loss of the flora, for its own sake and because plant communities largely constitute the 'habitats' in which other components of biodiversity live. In a very short span of evolutionary time the flora has been subject to enormous changes wrought by forest clearance, increased fire frequency, wetland drainage, urban and rural subdivision, introduced mammals, birds and insects, and an enormous influx of exotic plants. There is no clear end in sight for most of these effects, or for the new class of problems arising from global climate change. The latter is just one of several threats to biodiversity originating outside New Zealand, driven by a global economy on which we seem to have little influence.

Forests, both native and exotic, play a very significant role in maintaining indigenous biodiversity. Lowland forest ecosystems, now much depleted in extent, contain many of our more