

IMPROVING EXOTIC FORESTS FOR NATIVE BIRDS

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ABSTRACT

The results of a study in the Rai-Whangamoia and Golden Downs State Forests near Nelson in the South Island show that native birds which feed on fruit and nectar, and those which nest in tree holes, are adversely affected by conversion of native forest to conifer plantations. Young plantations are particularly poor habitats for most native birds, but some insectivorous species thrive in conifer stands more than 30 years old. Exotic forests could be improved as native bird habitat by (1) preserving areas of natural vegetation within plantations, (2) planting amenity areas with attractive food plants for birds, (3) retaining some old or dead trees as nest sites, (4) providing nest boxes, and (5) increasing local habitat diversity by creating a mosaic of stands of different ages and types. In larger exotic forests where very little native forest remains, some old conifer stands could be retained and managed as sanctuaries for certain native birds.

INTRODUCTION

New Zealand now has about one million ha of exotic forest and continued planting is expanding this area rapidly. By the year 2000, conifer plantations could occupy 1.5 million ha and eventually perhaps 2.3 million ha, or 8.7% of the total land area (N.Z. Forest Service, 1980). Most plantations are *Pinus radiata*, which is grown for both timber and pulp and is managed on short rotations of 30 years or less.

The impact of exotic forest expansion on native birdlife has caused considerable concern and debate (Jackson, 1971; Heinekamp and Ramsay, 1973; Bull, 1981), especially where mature or regenerating native forest has been cleared to make way for conifer plantations.

Since pine plantations will continue to cover a significant proportion of our landscape for the foreseeable future, it is worth while considering ways in which they might be improved as native bird habitats.

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TABLE 1: OCCURRENCE OF FOREST-DWELLING BIRDS IN CONIFER PLANTATIONS IN NEW ZEALAND

Commonly Present	Sometimes Present	Absent
†Silvereye (<i>Zosterops lateralis</i>)	†Bellbird (<i>Anthornis melanura</i>)	†Kokako (<i>Callaeus cinereus</i>)
Grey warbler (<i>Gerygone igata</i>)	†Tui (<i>Prosthemadera novaeseelandiae</i>)	†*Yellow-crowned parakeet (<i>Cyanoramphus auriceps</i>)
Fantail (<i>Rhipidura fuliginosa</i>)	†NZ pigeon (<i>Hemiphaga novaeseelandiae</i>)	†*Red-crowned parakeet (<i>Cyanoramphus novaeseelandiae</i>)
Whitehead (<i>Mohoua albigilla</i>)	*Rifleman (<i>Acanthisitta chloris</i>)	†*Kaka (<i>Nestor meridionalis</i>)
Ti (<i>Petroica macrocephala</i>)	*NZ kingfisher (<i>Halcyon sancta</i>)	*Yellowhead (<i>Mohoua ochrocephala</i>)
Shining cuckoo (<i>Chalcites lucidus</i>)	*Morepork (<i>Ninox novaeseelandiae</i>)	Great spotted kiwi (<i>Apteryx haastii</i>)
Long-tailed cuckoo (<i>Eudynamis taitensis</i>)	Robin (<i>Petroica australis</i>)	
†Blackbird (<i>Turdus merula</i>)	Brown Creeper (<i>Finschia novaeseelandiae</i>)	
†Song thrush (<i>Turdus philomelos</i>)	Weka (<i>Gallinallus australis</i>)	
Hedge sparrow (<i>Prunella modularis</i>)	NZ falcon (<i>Falco novaeseelandiae</i>)	
Chaffinch (<i>Fringilla coelebs</i>)	Brown kiwi (<i>Apteryx australis</i>)	
Goldfinch (<i>Carduelis carduelis</i>)		
Redpoll (<i>Acanthis flammea</i>)		
Greenfinch (<i>Carduelis chloris</i>)		

†Partially frugivorous or nectar-feeding

*Obligate hole-nester

Species listed below the line are introduced European passerines.

EFFECTS OF PLANTATION FORESTRY ON BIRDS

A recent study in the Golden Downs and Rai-Whangamoia State forests near Nelson set out to determine the effects of plantation forestry on birds by directly comparing bird numbers in a range of seven different conifer plantations and five nearby areas of native beech/podocarp forest at a similar altitude (Clout, 1980). The results of this study have recently been published (Clout and Gaze, 1984), and the main conclusions can be summarised.

Several native birds (bellbird*, tui, New Zealand pigeon, rifleman, tit, silvereye, grey warbler) were significantly more common in native forest than in plantations and two of these (New Zealand pigeon, rifleman) were virtually absent from the plantations studied. On the other hand, two native species (brown creeper and robin) were particularly common in old conifer stands, perhaps because they naturally prefer structurally simple forest with dense canopies and bare leaf litter. Young conifer plantations were generally the poorest habitat for native birds. In direct contrast to native species, most of the introduced birds (*e.g.*, chaffinch, redpoll, goldfinch, hedge sparrow, song thrush) were commonest in pine plantations, which are broadly similar to the natural habitats of some of these birds in the Northern Hemisphere.

Results of the Nelson study show that conversion of native forest to plantations reduces the numbers of frugivorous and nectar-feeding birds and those requiring tree holes for nesting. Seed-eaters, and insectivores which do not nest in tree holes are less affected and may even benefit from the change. There are several introduced species in this latter category. The Nelson study areas did not contain all of the bird species in New Zealand which might be affected by plantation forestry but the results of other studies (Gibb, 1961) and surveys (Bull, 1981) confirm the general nature of the above conclusions. When all of the forest-dwelling birds which still exist in the North and South Islands are classified according to their occurrence in conifer plantations (Table 1), all of those commonly present are introduced or native insectivores or seed-eaters which do not nest in tree-holes, and most of those absent are native frugivores or hole-nesters. Several of these latter species are rare or restricted in their distribution. Those species which sometimes occur in

*Scientific names of bird species are given in Table 1.

plantations include frugivores, nectar-feeders and hole-nesters, together with weka, New Zealand falcon and North Island brown kiwi (Reid, 1983).

LONGER TERM IMPLICATIONS

In general, older exotic stands provide better habitat for native birds than young stands, because they contain more native plants in the understorey and may even have some suitable nesting holes in the trees. However, on current trends, there will in future be a smaller proportion of old conifer stands in New Zealand, because of the continuing reduction in mean rotation length. In 1976-1980 the average age of *Pinus radiata* stands at felling was 48 years but this is expected to decline to 29 years by 1996-2000 (Levack, 1979). Current practice is to prune and thin *P. radiata* stands to a final crop density of ca 300 stems/ha before they are 10 years old and to clearfell at 25-30 years, or even earlier where trees are being grown for pulp. In future there will be virtually no pine stands over 30 years old, which suggests that hole-nesting species (e.g., rifleman, New Zealand kingfisher, morepork) and other birds favouring old stands (e.g., robin, brown creeper) will occur even less often in conifer plantations. Furthermore, it is likely that the second crop of pine trees to be grown on an area which was previously native forest will have a poorer native understorey (and hence fewer birds) than the first crop, because of a diminished native "seed bank" in the soil.

RETAINING NATURAL HABITATS

The best way of maintaining a variety of native birds within an exotic forest is to retain as much natural habitat as possible in the local area. Some native birds (e.g., kaka, parakeets), require very large areas of native forest for their survival (Hackwell and Dawson, 1980) and it is unlikely that such species could be conserved inside the boundaries of an exotic forest. However, there are several other birds which could be conserved by retaining moderate sized patches of native forest. An example is the rifleman, which rarely penetrates conifer stands but which survives at Golden Downs in forest remnants over 100 ha in area. Native residents (e.g., tit, robin) of older plantations can also be helped by preserving patches of native forest, because these provide areas of stable habitat from which surrounding plantations may be colonised from one rotation to the next as they reach a suitable growth stage.

New Zealand pigeons, tuis and bellbirds benefit greatly from the retention of native forest within plantations. These birds are capable of travelling between habitats to exploit seasonal foods and all of them require some access to native forest for their survival. New Zealand pigeons do not use conifer plantations to any significant extent, but they can survive in the larger forest remnants and may visit even the smallest patches to feed on seasonal fruits. The dependence of tuis and bellbirds on native forest is illustrated by comparing their abundance in the Golden Downs (35 000 ha) and Kaingaroa (137 000 ha) State Forests. Golden Downs contains several bush remnants and supports both tuis and bellbirds, whereas Kaingaroa consists mainly of continuous conifer plantations, and tuis and bellbirds are recorded only occasionally (Gibb, 1961). Results from Golden Downs (Clout, 1980; Clout and Gaze, 1984) suggest that patches of native forest act as seasonal "oases" where tuis and bellbirds congregate in autumn and winter to feed on beech honeydew and native fruits.

The most valuable native forest remnants for bird conservation within plantations are large and intact (*i.e.*, unlogged) ones which can act as foci of distribution for native species. Ideally several such native reserves should be evenly distributed throughout the plantations, but in most established exotic forests there is little remaining native forest and hence virtually no scope for planning the size or distribution of reserves. Here the best that can be done is merely to preserve all of the native forest patches which remain, no matter how small. Even very small remnants in gullies or on steep slopes are valuable as seasonal food sources for mobile birds. Unfortunately, they are also especially vulnerable to damage around their margins during felling or road building and should therefore be carefully protected when such operations are in progress.

Most of the above comments about native forest also apply to other natural habitats, such as swamps, ponds and watercourses which may support birds such as fernbirds (*Bowdleria punctata*), bittern (*Botaurus stellaris*), crakes (*Porzana* spp.) and waterfowl. Such habitats should be carefully preserved wherever they exist in exotic forests and protected from drainage, margin damage or infilling with debris during forest operations.

ENHANCEMENT OF AMENITY AREAS

In most exotic forests small areas are set aside as amenity plantings, often along public roads and around picnic areas. These areas are primarily for scenic or recreational purposes,

rather than production, and they are often planted with species such as larch (*Larix decidua*), *Pinus patula*, alder (*Alnus rubra*) and poplars (*Populus* spp.) to enhance their appearance. There is considerable scope in such areas for planting other species which will attract mobile native birds such as tui, bellbird, silvereve and New Zealand pigeon.

In choosing the species to be planted the aim should be to provide a succession of food sources for native birds. Attractive native plants for this purpose include kowhai (*Sophora* spp.) for palatable foliage in winter and nectar in spring, *Fuchsia excorticata* for nectar in spring and fruit in summer, and flax (*Phormium* spp.) for nectar in summer. In warm North Island areas pohutukawa (*Metrosideros excelsa*) produces abundant summer nectar and puriri (*Vitex lucens*) produces both nectar and fruit for most of the year. Other good fruiting species include *Coprosma* spp., *Lophomyrtus* spp., putaputaweta (*Carpodetus serratus*), pigeonwood (*Hedycarya arborea*), tawa (*Beilschmiedia tawa*) and large podocarps such as rimu (*Dacrydium cupressinum*) and miro (*Prumnopitys ferruginea*), which is a favoured autumn and winter food source for New Zealand pigeons. Useful introduced plants include *Eucalyptus* spp. (especially the winter-flowering *E. leucoxylon* and *E. sideroxylon*), *Banksia* spp. (for nectar), *Prunus* spp. (for palatable foliage, flowers and fruit), and *Cytisus* spp. (e.g., tree lucerne), for nectar and palatable foliage which will attract tuis and New Zealand pigeons in spring.

Planting of amenity areas and roadsides with combinations of the species mentioned above will not only benefit native birds but also those members of the public who would enjoy seeing both birds and attractive plants.

PROVISION OF NEST SITES

Several species of native birds are hole-nesters. Although some of these (e.g., kaka, parakeets, yellowhead) never inhabit conifer plantations, others (e.g., morepork, New Zealand kingfisher) sometimes occur in older stands. It should be possible to improve plantations as nesting habitat for such species by retaining old or dead trees with holes in them when stands are felled and replanted. This is now a common practice in the management of coniferous forests in North America (McLelland *et al.*, 1979; Mannan *et al.*, 1980), where wildlife conservation is an important part of forest management. In New Zealand plantations, long-tailed bats (*Chalinolobus tuberculatus*) might

also benefit from retention of old or dead trees, as they have been recorded roosting in dead pines (Daniel, 1981).

Another way of making nest sites available for hole-nesting birds in plantations is to provide artificial nest-boxes. This has already been done in New Zealand plantations when Gibb (1961) successfully encouraged tits to nest in nest-boxes in a pine stand at Kaingaroa. Moreporks and riflemen are also known to use nest-boxes and New Zealand kingfishers may nest in them as well. Boxes can be specially designed and sited to suit particular species.

DIVERSIFICATION OF EXOTIC STANDS

The diversity of bird species which will inhabit an area increases with habitat diversity (MacArthur and MacArthur, 1961; Roth, 1976). For this reason the creation of large areas planted with trees of the same species and similar age should be avoided wherever possible. A juxtaposition of stands of different species and ages will increase the range of habitat types available to birds in an area, especially if compartments are relatively small. Different understories (and associated invertebrates) occur in young, open plantations and old, dense stands; where both are locally available to birds the range of food sources and nest sites will therefore be greater.

Juxtaposition of different-aged stands is also likely to improve the chances of colonisation and recolonisation by birds as the habitats within compartments change with age and become suitable for certain species. For instance, it is known that robins may inhabit older exotic stands, but that they also have limited dispersal powers. The likelihood of a compartment being colonised by robins as it ages and becomes suitable for them is therefore greater where there are old stands nearby to act as a source of colonists.

Stable patches of native forest provide the best foci of distribution for many native birds within an exotic forest but some large exotic forests (*e.g.*, Kaingaroa, Kinleith, Balmoral) contain virtually no native forest. In such areas the retention of a few old exotic stands and their management as sanctuaries for certain native birds would be a valid management option. Species which could benefit from such a policy include morepork, robin, brown creeper, whitehead and especially the rifleman, which rarely occurs in plantations less than 30 years old. Compartments of old first-crop trees could therefore act as islands of relatively favourable bird habitat within a sea of younger plantations. They

would not be as good as areas of native forest, but if left for long enough (>100 years?) they would continue to improve as habitat for a range of native birds as their understorey developed and a higher proportion of dead trees (with suitable nesting holes) became available. The original plantations established in the 1920s and 1930s contained a greater variety of coniferous species than is planted now and some of these stands may be of historical interest to foresters in addition to their potential as sanctuaries for certain native birds.

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