# SCIENTIFIC RESERVES IN NEW ZEALAND INDIGENOUS FORESTS

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*SYNOPSIS*

*In many countries undisturbed land and vegetation is being reserved for scientific comparison with formerly comparable developed areas. The New Zealand Forest Service is adding to this world network by reserving examples of forest types and environment for scientific research. The progress being made and some of the attendant problems are broadly discussed. The hope is expressed that scientists will take full advantage of this pioneer work.*

## THE CONCEPT

During the past few decades, scientists throughout the world have increasingly been urging on governments the idea that selected areas of landscape and vegetation, still unmodified by man, should be reserved in perpetuity as "natural areas" for scientific and educational purposes. The prime function of these reserves is as reference areas or controls for monitoring the effects of man's occupation and use of most of the land surface of the world. Ideally, each reserve should be a standard for evaluating changes wrought in disturbed ecosystems that were formerly comparable to that standard. The basic concepts have been reviewed by Moir (1972). Two quotations in Moir's article, the first from Russia, the second from the United States, are worth repeating.

"Reserves in the U.S.S.R. are scientific institutions removed from economic utilization and located over the most important geographical zones and landscapes, and destined for permanent and complex investigations on natural resources under undisturbed conditions" (Bannikov, 1969).

"There is high scientific value in preserving examples of typical environments. . . . Areas preserved for long term scientific use provide natural laboratories for the study of ecosystems in all their complexity. . . . They can serve as check areas or yardsticks for the use, protection and management of comparable areas of land . . ." (U.S National Committee for I.B.P., 1967).

The ecologist's ecosystem is a compound of biological community and environment, the whole of which is regarded as a functional system of complementary relationships, including the transfer and circulation of energy and matter (a definition

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from Whittaker, 1970). The element of importance in the context of this paper is that each ecosystem containing forest has a unique forest type or pattern of types.

## THE NEW ZEALAND SITUATION

There are probably hundreds of ecosystems in New Zealand. Frequent, and often abrupt changes in the geology and terrain cause marked differences in climate, soil and vegetation over short distances. These are complicated further by the still evident effects of Pleistocene glaciations, later minor climatic fluctuations, volcanic outbreaks in parts of the North Island, and a universal tectonic instability. The effect of man since the Polynesian "moa hunters" arrived more than 1000 years ago has been superimposed upon this natural diversity; two-thirds of the land has been used in various ways, and the vegetation and soil, in places even the terrain, greatly altered.

"Primitive New Zealand was a forest land" (Masters *et al.*, 1957). Only the mountain tops above 1500 m in the North Island and 1300 m in the South Island were barren when man first came. Minor areas below had vegetation other than forest: deep swamps, some gravelly river flood plains, pockets of extremely infertile soil, and so on. Therefore, although there are cogent reasons for conserving and studying the few remnants of primitive non-forest vegetation (including those of the "semi-natural" fernland and tussock grassland induced by burning in distant "moa hunter" and Maori times) it is from research in representative forested ecosystems that the most far-reaching results conducive to wise land management may be expected in this country.

The total area of indigenous forest is approximately 5.5 million hectares, covering about 20% of the land surface. Nearly 3 million hectares are controlled by the New Zealand Forest Service, and another million hectares are administered by the National Parks Authority and the Department of Lands and Survey.

A National Forest Survey of indigenous forest resources was made after World War 2. It gave the Forest Service a comprehensive knowledge of the ecology of lowland forest types in all appreciable areas of indigenous forest throughout the country, irrespective of tenure (Thomson, 1946, 1947; Holloway, 1947 and 1954). Subsequent mountain land surveys by the Forest and Range Experiment Station of the Forest Research Institute added to our knowledge of the distribution of sub-montane and montane forest types. The junior author, first in conjunction with P. J. McKelvey but latterly on his own, continued with more intensive ecological studies of North Island forests. He provided not only detailed type maps but also a classification of forest types, which can be used as a guide for selecting associations to be reserved and for determining forest sanctuary policy (McKelvey and Nicholls, 1957). Finally, Botany Division of the Department of Scientific and Industrial Research commenced a survey of the flora in National Parks and is collecting invaluable knowledge of the ecology of the plant associations there represented.

All this information was of immense value when, in 1965, the National Parks Authority decided that there should be a joint Lands Department - Forest Service survey of all New Zealand's Scenic Reserves. Originally, the survey aimed at determining which Scenic Reserves were still serving their original purpose, which could no longer be classified as Scenic Reserves, and which should preferably be added to nearby State Forests or otherwise have their tenure changed (McCaskill, 1972).

It soon became apparent that the joint survey provided a welcome and unexpected opportunity to look at the botanical composition and scientific importance of Scenic Reserves, and study them in the context of the whole field of nature protection throughout New Zealand. In other words, it enabled the problem of achieving desirable reserves of all New Zealand forest associations to be tackled on a broad front instead of piecemeal. As a result of the survey, in which L. W. McCaskill played a major part, it was possible for the Forest Service and the Botany Division to advise on the scientific importance of existing forested reserves. Of equal importance, they were able to point out unreserved areas of outstanding scientific value which were not held by the Crown.

This exercise was discussed fully and endorsed by the Multiple Use Working Party of the Forestry Development Conference. The Conference itself passed a resolution urging the early completion of the joint survey, and was concerned that special consideration be given to reserving representative areas of lowland forests (F.D.C., 1969).

Similar consideration and discussion took place at the Land Use and Land Resources Working Party of the Physical Environment Conference, and subsequently at the Conference itself. The resulting Conference Resolution stressed the urgency arising from increasing pressure on land resources leading to the modification and elimination of indigenous vegetation (P.E.C., 1970).

The survey showed that nearly all the forest types do occur within the three main categories of Crown tenure. The main exceptions were some types of coastal forest and remnants of lowland forest in closely settled districts. The National Parks Authority and Lands Department have declared a policy of creating strictly scientific zones within Scenic Reserves and National Parks where the only or best example of a forest type exists. It is also their policy to acquire forested land from private owners, wherever this has been recommended by the Forest Research Institute or the Botany Division of the DSIR. The National Parks Authority has legal provision (Section 12 of the National Parks Act) to give full protection to strict scientific reserves by the creation of Special Areas. Those organizing the joint survey of Scenic Reserves soon found it necessary to recognize different categories of reserves — Scenic (two classes), and Conservation and Scientific "where scientific study of plant and animal communities, soil types and geological features, is the primary concern" (McCaskill, 1972). It is understood that legislation is envisaged to give Scientific Reserves greater legal protection than they enjoy

at present. The scope of implementing this policy is, however, limited. Most Scenic Reserves are small, and many suffered some burning or felling before reservation. Altogether they are a poor sample of the very wide range of indigenous forest types. More opportunity exists within National Parks but these contain mainly montane forest, and again many forest types are absent. If we are to have good representative examples of all forest types contained in reserves for scientific purposes, as indeed we should have, most by far must be established within State Forests.

## IMPLEMENTATION IN STATE FORESTS

The New Zealand Forest Service has been working towards this goal for several years. The responsibility of selecting suitable areas has been largely that of the junior author, but proposals for reservation have originated from several sources and levels. Early attention was given to reserving examples of major types that have become comparatively rare — *e.g.*, types of kauri forest and the dense podocarp types of the central North Island — but generally identification of suitable reserves is an integral part of the current Forest Service regional planning programme. So far, therefore, most recommendations have concerned scientific reservations in State Forests included in the Southland and Westland "beech schemes" (White Paper, 1971), in the Kawhia - Te Kuiti district, on the Hahungaroa and Rangitoto Ranges, on the Mamaku plateau and on the Kaimai and Coromandel Ranges. Broadly speaking, these regions are ecological entities, each with a large measure of unique landscapes and forest types.

Wherever possible, forest type sequences are reserved, where each type represented is an interdependent member of a particular sequence in a particular environment. The reservation of a recognizable gradient or series of types should ensure the conservation of a distinct ecosystem incorporating vegetation, land forms, soil types, bird and other wildlife habitats, a particular hydrological regime, and so on. At the same time we are aware that the virgin indigenous forest is not everywhere in a steady state, perfectly adjusted to the present environment. Some reserves will specially cover or include examples of apparently anomalous forest patterns.

Implementation of this basic philosophy of ecosystem conservation will result in a New Zealand network of scientific reserves in State Forests. Our prime concern is to reserve tracts of the typical forest of each ecological region. From this it follows that areas of merchantable forest, manageable production forest, and areas suitable for clearing for exotic forestry or farming will have to be included. These, of course, are the very types that should be reserved. They belong to ecosystems that have been, and are being, most widely and intensively disturbed by man, initiating new ecological trends in directions that are at present unpredictable.

Scientific objectivity must be maintained in the selection of scientific reserves. Some people have confused the primary purpose with other objectives of conservation. Aesthetic con-

siderations or sentiment must be subordinate to scientific values. For instance, objections have been made to reserving forest with many unsightly dead or dying trees; but these are often stands of great scientific interest. One question ecologists wish to answer is: are our indigenous forests subject to periodic rapid "overturn" of dominant tree species or, on the other hand, is succession a relatively slow and orderly progression?

## LEGAL STATUS, MANAGEMENT AND RESEARCH

The scientific reserves in State Forests established so far have been gazetted under the provisions of Section 20 of the Forests Act, 1949. Under the Act an area of State Forest land may be set aside by Vice-Regal Proclamation ". . . as a forest sanctuary for the purpose of preserving in their natural state the indigenous flora and fauna thereon and for scientific and other like purposes". The Proclamation can be amended or revoked only by Act of Parliament. Such legal security should encourage recognition by national and international organizations of scientists.

The Forests Act also states that ". . . the provisions of this Act as to State Forest land shall be applied in such a manner which will ensure that the purposes for which the sanctuary has been established will be at all times maintained and protected".

This clause could be interpreted as excluding public entry, and thus interfering unduly with the projected wider use of State Forests for recreation. The term "sanctuary" does suggest *tapu*, but under the provisions of the Act it is necessary to bar public entry only when scientific values are endangered or scientific research is hindered. It seems inescapable that many reserves will sooner or later be crossed by walking tracks; in any case, these will often have to be provided for research workers. Rigid prescriptions to exclude man or animals would be unrealistic for many other aspects of protection and management of these reserves. The degree to which deer and opossums, when present, should be controlled, or generally accepted as now part of the ecosystem, and thus part of the scientific study, are questions that can be answered only after several years' experience.

The number of sanctuaries proclaimed so far is fewer than might be expected owing to stringent provisions for boundary surveys which have only recently been relaxed (N.Z. Forest Service, 1972). Nevertheless, there are already thousands of hectares of indigenous forest specifically set aside for scientific purposes. They await the attention of ecologists and kindred specialists. The Forest Research Institute is examining sampling methods that are suitable for defining and mapping the forest communities that are present in each reserve, and for compiling floristic lists. A map and inventory of the forest is an essential first step which should pave the way for studies of the function and productivity of naturally forested ecosystems.

The end result should be a network of legally and physically protected strict scientific reserves. It is hoped that the N.Z. Forest Service, the DSIR, Department of Lands and Survey, other government departments, the universities, and the Royal Society, will co-operate in establishing a recognized and definitive check-list of reserved forest communities which are of sufficient importance to have international recognition. It would be appropriate for the Royal Society to accept responsibility for the recording, documentation and maintenance of this check-list.

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