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BOTANICAL RANKING FOR NATURE CONSERVATION

by

W .B. Shaw

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by
W.B. Shaw
Bay of Plenty Conservancy, Department of Conservation, PO Box 1146, Rotorua

ABSTRACT

In the mid-1980s the Department of Lands and Survey and New Zealand Forest Service organised the Urewera/Raukumara planning study. Some sections of the planning study were completed but the overall project was not finished because of the dissolution of the parent departments.

A set of botanical ranking criteria were developed during the planning study. This was a five-level system to evaluate and rank indigenous vegetation and flora. The ranking system was used extensively during the planning study and has since been applied widely by the Department of Conservation.

The ranking system is presented in this report, with some discussion of its application and limitations.

1. INTRODUCTION

In 1984-85 the Department of Lands and Survey and the New Zealand Forest Service jointly organised and funded a land use study known as the Urewera/Raukumara planning study. The aim of the study was to gather all relevant resource information, and to rank land use suitability for a wide range of potential uses (see the section below on objectives). Thus the aims were similar to other land use studies that have been carried out in New Zealand; e.g., Purey-Cust and McClymont, (1979) and Wilkinson and Garratt, (1977). The study included all lands administered by the Department of Lands and Survey and New Zealand Forest Service in eastern North Island, between the Rangitaiki River and East Cape, and the Bay of Plenty Coast to inland Hawkes Bay. This includes all or parts of 14 ecological districts (see Figure 1). Refer to McEwen (1987) for a description of these ecological districts. The study included about 70 separate land units, totalling more than 525,000 hectares.

The project included sections on vegetation, wildlife, fisheries, water and soil values, cultural values, agriculture, indigenous forestry and recreation. It was intended that all sections be linked together by a final planning overview, but this was not completed. The latter stages of the project coincided with a period of major reform of New Zealand government departments and the two coordinating agencies were disestablished. Nevertheless a number of reports and publications were completed on the following topics; botanical conservation values (Shaw, W.B. 1988), water and soil values (Shaw, D.J. 1985a; 1987), wildlife (Shaw, D.J. 1985b), and cultural values (Stokes *et al.* 1986).

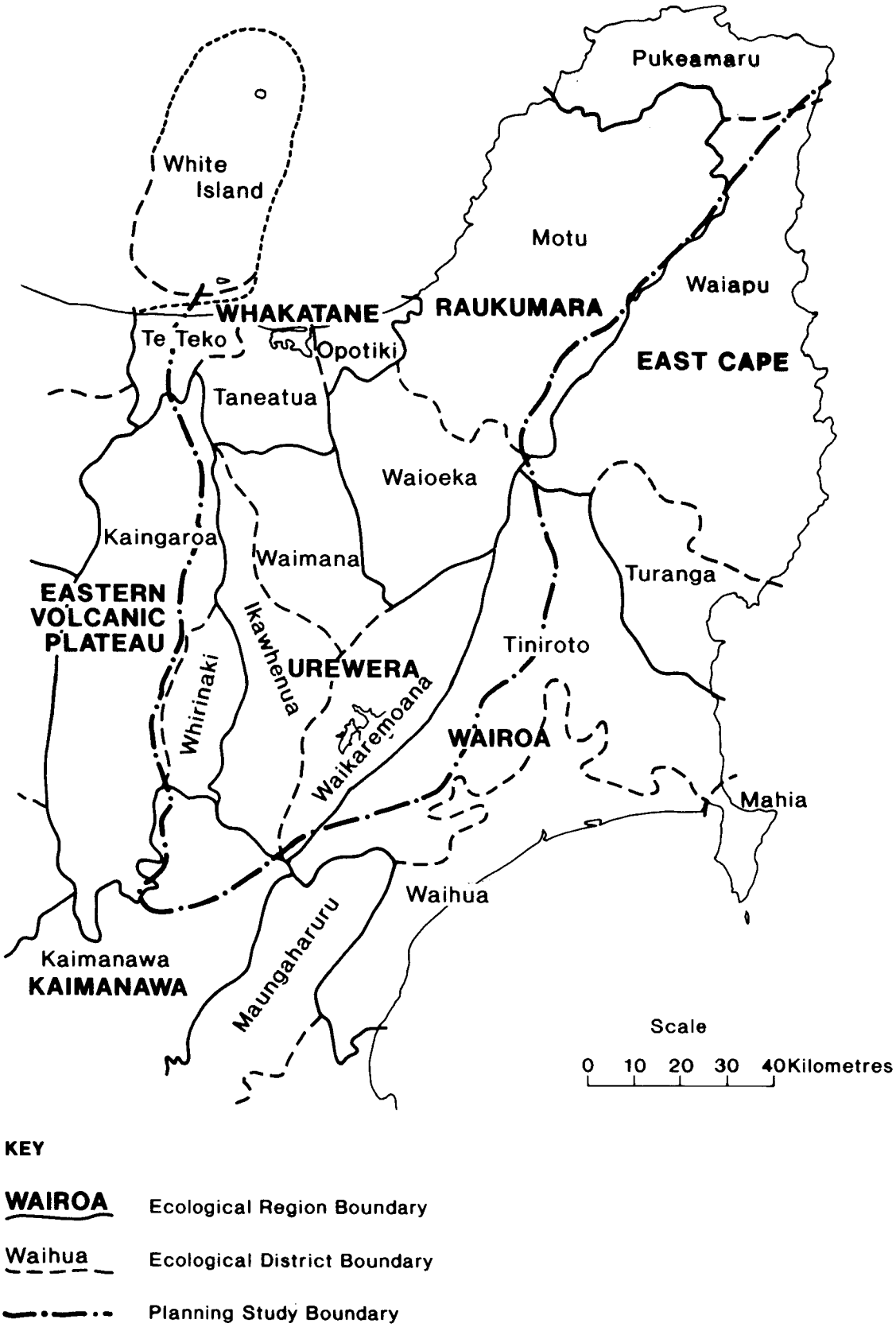

Figure 1 **Boundaries of Urewera-Raukumara planning study area and relevant ecological districts.**

Most of the land included in the planning study is now administered by the Department of Conservation.

The author's role in the study was to compile an inventory of indigenous vegetation, and to assess botanical conservation values for all of the study lands. The aim of this account is to outline a qualitative botanical ranking system which proved useful for the Urewera/Raukumara planning study, and which has since been applied more widely (refer to Discussion section below) and revised somewhat as the result of wider application. Some limitations of the system are outlined in the Discussion section.

1.1 Primary objectives of the planning study

1. To gather all relevant natural and cultural resource information pertaining to Crown-owned land in the study area, and to assemble it in a manner useful for land and resource use planning purposes.

2. To assess and rank the suitability of the land for all existing and potential uses and values likely to be of relevance in the study area.

1.2 Methodology

The following approach was used:

1. The first stage was to compile existing botanical information for each of the study lands. This involved a literature search, assessment of unpublished vegetation plot data, and consultation with key scientific and field workers.
2. Where insufficient information was available, field inspections were made but extensive primary data gathering was not an objective of the study. Information was gathered primarily at a vegetation type level (cf. Atkinson 1985). Aerial inspections (fixed wing aircraft and helicopters) were made of some study lands.
3. Where there were large tracts of relatively unmodified indigenous vegetation an assessment was made to define representative examples of the natural character of an ecological district. This exercise had already been carried out for some large tracts of State Forest and State Forest Park by the New Zealand Forest Service. Refer to Appendix 2: Ecological Area Selection Criteria.
4. A set of criteria were defined to rank all areas for botanical conservation value and all areas were ranked accordingly.
5. Priorities for further inventory (e.g., protected natural area survey) were assessed.

2. BOTANICAL CONSERVATION RANKINGS

2.1 Background

A key component of the exercise was the formulation and assigning of conservation rankings.

The formulation and use of ranking systems to assign measures of relative conservation value for natural features is complex, subjective, and can be beset with many pitfalls. Attempts have been made by other authors to quantify the various components of natural systems and to produce a numerical 'Conservation Status Index' (e.g., Park and Walls 1978; Ogle 1981; Overmars 1981). This level of approach was not deemed suitable for the planning study for the following reasons:

1. The widely varying levels and quality of information available for the various study lands and the wide range of characteristics exhibited on the study lands.
2. Quantitative ranking systems often imply a high level of precision. This was not considered appropriate in light of (1) above, and broad-band ranks were considered more realistic.

Ogle (1981) concluded that "any ranking system which uses a range of sound ecological criteria to obtain a scientific appraisal of a habitat would give results compatible with those of any other soundly-based system".

The approach chosen was to design and use a qualitative ranking system which would accommodate two distinct situations and various permutations of these situations.

1. An ideal situation where an ecological district largely or entirely still has its natural or largely natural vegetation cover.
2. The now common-place situation in many ecological districts where only small, widely scattered remnants of the original vegetation cover remain. These are often heavily modified and/or seral or secondary successions.

The ranking system recognises a set of botanical conservation values based on sound scientific and conservation management principles directed towards the protection and maintenance of biodiversity. These principles have been elucidated in various works in New Zealand and in other countries. For examples see Anon. 1981, 1985; Atkinson 1961; Bassett 1977; Bassett and Miers 1984; Clarkson and Clarkson 1991; Fleming 1975; Game and Peterken 1984; Gehlbach 1975; Goldsmith 1975; Helliwell 1971; Herbert 1982; Kelly 1980; Law *et al*. 1984; Master 1991; Moore *et al.* 1984; Ogle 1981; O'Connor *et al.* 1990; Overmars 1981; Park and Walls 1978; Peterken 1981; Ratcliffe 1971, 1977; Tans 1974; Thomson and Nicholls 1973; Wright 1977.

Practical implementation of these principles has occurred with frequent on-going ad-hoc assessment of land under consideration for potential conservation protection, systematic reserve surveys (e.g., Beadel and Shaw 1988; Clarkson and Regnier 1989: Kelly, G.C. 1972) and protected natural area programme surveys (e.g., Clarkson *et al*. 1986; Fspie *et al.* 1984; Regnier *et al.* 1988).

Overmars and O'Connor (1983) outline the principal **scientific** objectives involved in nature conservation:

1. Study and understanding of nature and natural processes.
2. Provision of baselines for study and understanding of changes in modified or cultural systems and assessing their sustainability.
3. Maintenance of genetic diversity and evolutionary processes.
4. Protection of rare and endangered species.

A highly effective and low risk conservation strategy that serves all of these objectives embodies two principles; protection of substantial representative natural areas, and protection of habitats, including habitats of threatened species.

O'Connor *et al.*, (1990) list seven criteria that form the scientific basis for nature conservation evaluation:

1. Representativeness (the primary criterion)
2. Diversity and pattern
3. Rarity and special features
4. Naturalness
5. Long-term viability
6. Size and shape
7. Buffering and surrounding landscape.

2.2 Ranking criteria

The following criteria are arranged in a five-level scale, ranging from `exceptional' to 'low/potential'. This scale is comparable with the New Zealand Wildlife Service (now part of the Department of Conservation) ranking system for indigenous fauna (refer to Ogle 1981). No numerical values are attached to the various criteria, though this could be done for a conservation assessment within a particular ecological region or ecological district. Notes on the practical application of the criteria are contained in Appendix 1.

The criteria are as follows:

1. Exceptional

(a) High quality[1] examples of nationally rare vegetation types, e.g.:

- wetlands
- indigenous sand dune communities
- lowland conifer-dominant forest
- mainland pohutukawa forest
- pohutukawa-hard beech forest.

Vegetation communities of great conservation value, e.g.:

- Offshore islands or sizeable "mainland islands" with high quality indigenous vegetation unaffected or largely unaffected by browsing animals.

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1 Dominated by indigenous vegetation types/species and containing few or no exotic taxa.

- Nationally rare successional vegetation sequences or mosaics, where this can be assessed.
- Containing no introduced plants, where this is an exceptional situation for the vegetation type concerned.

(c) Sites where a vegetation type or more than one species attain a national or disjunct distributional limit.

(d) Sites where a threatened taxon occurs which is endemic to the relevant ecological district or ecological region, or 2-3 ecological districts within adjacent ecological regions.

(e) Sites where 'endangered' taxa occur; i.e. taxa threatened with extinction in the wild (Given 1981).

Sites where 'vulnerable' taxa occur; i.e., taxa believed to be in danger of moving into the 'endangered' category if the factors causing depletion continue to operate (plants in this category are usually diminishing in abundance or geographic range) (Given 1981; Cameron *et al.* 1993).

(f) Sites where a vegetation type (cf. Atkinson 1985) occurs which is endemic to a particular ecological district or region.

(g) Large[2] areas which are entirely or to a significant degree representative of the natural character of an ecological district, cf. Ecological Areas. See Methodology section above, and Appendix 2 for Ecological Area selection criteria.

2. Very High

(a) The last or one of a few remaining (up to 3-4) examples of a vegetation type which was once widespread in an ecological district. The example(s) must still largely exhibit its/their natural character.

(b) Containing regionally rare vegetation types that form part of a larger tract of vegetation: e.g., subalpine herbfield surrounded by a large area of subalpine and montane indigenous forest.

(c) An example of the vegetation of an ecological district that forms a continuous ecological or altitudinal sequence across a large part of an ecological district.

(d) The only or one of a few remaining examples of a secondary succession that has developed following disturbance to the vegetation by human activities in pre-European or early European times.

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2 Preferably larger than 1,000 hectares, but 300 - 500 hectares in districts where no larger areas remain.

(e) Good quality example(s) or the only example(s) of a secondary succession that has developed following disturbance, e.g., mass ground movement, storm damage, or fire.

(f) Nationally rare ecosystems or vegetation types which have been degraded in value, e.g., relatively large wetlands of natural origins containing conspicuous adventive plants; rare subalpine or alpine vegetation types surrounded by developed farmland; a rare shrubland type containing pines. Relative size and quality will need to be assessed within the context of the relevant ecological district.

(g) Sizeable (>100 ha) examples of secondary vegetation where there is relatively little (e.g., <5%) indigenous vegetation cover remaining in an ecological district.

Areas of an early secondary vegetation succession developing after major or repeated disturbance by humans where the present vegetation type (e.g., bracken fernland, manuka scrub) is vastly different from the vegetation type which would or could develop on the site over a very long period of time (e.g., tall forest) and where there are either very few or only very small remaining other examples of the natural vegetation of the ecological district; i.e. this secondary type is now representative of the natural character of the ecological district.

(h) Sites where individual taxa attain limits of national distribution (north, south, east or west).

3. High

(a) Good quality moderately large (>100 ha) examples of the indigenous vegetation typical of an ecological district where there are other better quality large (i.e. over 1,000 ha) examples present.

(b) The last or one of a few remaining examples of a vegetation type within an ecological district in a modified condition but retaining the main elements of composition and structure.

(c) An example of the indigenous vegetation of an ecological district that now forms part of a culturally interrupted ecological and/or altitudinal sequence across an ecological district; e.g., from the coast to inland ranges.

(d) Regionally rare vegetation types (intact or relatively unmodified) completely or largely surrounded by an essentially completed modified landscape, e.g., small urban reserves.

(e) Areas of unmodified or secondary vegetation which provide a buffer around areas or sites of 'exceptional' ranking. This could include exotic vegetation in some cases.

(f) Areas which conform to Very High (f) above but which contain a conspicuous element of exotic plant species which will eventually be replaced by indigenous plant species. Natural replacement may involve a very long period of time.

(g) Sites where 'rare' taxa or two or more 'local' taxa occur. Refer to Given (1981) for definitions of 'rare' and 'local'.

(h) Sites where taxa or vegetation types are part of or are very close to a local limit of distribution, e.g., the inland limit of pohutukawa.

4. Moderate

(a) Vegetation types or ecosystems which are substantially modified but still retain the main elements of their composition and structure, and where there are better examples elsewhere in the ecological district. Could include forest that has been selectively logged, cutover or lightly burnt.

(b) Small examples of indigenous vegetation where there are larger or better examples of a similar type(s) elsewhere in the ecological district, e.g., small remnants of tawa or kanuka forest.

(c) Parts of much larger areas as buffers around sites of high or very high rank.

5. Low/Potential

(a) Mosaic(s) of indigenous and exotic vegetation where the areas of indigenous vegetation are very small and of no particular significance or interest.

(b) Examples of an early secondary succession developing after major or repeated recent disturbance by humans where the present vegetation type (e.g., bracken fernland) is vastly different from the vegetation type which would or could develop on the site over a very long period of time (e.g., tall forest) and where there are other better quality representative examples of the vegetation in the ecological district.

(c) Examples of an early secondary succession where the vegetation is dominated by naturally established exotic plant species, e.g., abundant pines or *Hakea* amongst low indigenous shrubland, and where better examples exist in the ecological district.

(d) Sites that although containing indigenous vegetation are essentially human-made and are of recent origin, e.g., wetlands that were created for farm ponds.

2.3 Summary of Ranking Process

1. Ecological districts were generally used as a framework for assessment of botanical conservation value. The only exception was for vegetation types and taxa known to be nationally rare or at distribution limits.

2. A list was compiled of all lands under consideration.

3. Bioclimatic zones were defined within each ecological district.

4. Representative examples of indigenous vegetation were defined within each ecological district using criteria for selecting Ecological Areas (if this hadn't already been carried out).

5. Ranking criteria presented above were applied.

Note: It may not be necessary to carry out step 4 where large representative areas no longer exist, or where this exercise has already been carried out.

3. DISCUSSION

The ranking system worked well for the Urewera/Raukumara region, within the context of a regional planning study. However, ranking is a subjective process, dependent on a number of variables, including the knowledge and perceptions of the personnel carrying out the ranking, and the objectives of the project. Consequently no single ranking system can fulfil the requirements of every project. There is no such thing, in the author's opinion, as a universal ranking system for conservation value.

Ecological districts provide an essential practical framework for the ranking system. All assessments were confined to districts, except for the Exceptional rank which takes account of nationally significant features such as nationally rare vegetation types, taxa close to extinction, locally endemic taxa or vegetation types, and larger representative examples of vegetation. Nevertheless, the system was not designed for comparisons to be made between districts. To do this is an extension of the assessment, and could be done using subsets of one rank, e.g., see discussion of the `Exceptional' rank below.

There is merit in carrying out objective assessments of like features, rather than attempting to assign a rank for total conservation values (cf. Moore *et al*. 1984). Thus an area/land unit could be assigned rankings for vegetation, threatened plants, indigenous fauna, recreation, historic features and so on.

The assigning of the various criteria to the particular levels (i.e., ranks) of conservation value was based on a series of value judgements, and it may well be that different workers would rearrange the order of the criteria and may design and use different criteria which were either not suited to this particular study or were omitted through oversight. The application of ranking systems is a function of the cultural purposes for which they were developed. Likewise, criteria will be modified depending on cultural purposes.

The ranking system presented here is one approach that may have useful attributes or criteria that other workers can use. Also it can be adapted to suit other situations.

To date the ranking system has been applied by the Department of Conservation in at least three separate management Conservancies in central and eastern North Island (Bay of Plenty, East Coast and Waikato). The criteria have been used to assess issues such as the relative conservation value of land administered by the Department on which mining is proposed, as part of a multi-faceted planning approach to the management and setting of priorities for suites of reserves administered by the department, and as part of a priority-setting exercise for assigning pest animal control priorities (on a regional and a national basis). With limited funds for management, managers often are able to work with only a few priority areas. This may involve, for example, a subset of the 'Exceptional' areas. Obviously the criteria do not compare the relative values of areas given an 'Exceptional' ranking, yet managers may require this level of ranking to finally assign management funds. This is the next stage of ranking, which requires criteria specific to each exercise, which can be developed or verified in consultation with appropriate scientific and management personnel.

As already noted, the criteria presented above could be used to develop a numerical ranking scale, but this has not yet been attempted. A numerical score would be one way to integrate this botanical ranking system with the 5-scale approach of Ogle (1981) for ranking fauna habitats.

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APPENDIX 1

Notes on the Application of the Ranking Criteria in the Urewera - Raukumara Planning Study

1. The Urewera-Raukumara tract of indigenous vegetation is now, because of its very large size, an outstanding feature in the North Island of New Zealand. Low rankings for any particular part of the area would not detract from the conservation value of the tract and associated remnants as a whole.

2. Ecological districts were used as the framework for ranking; i.e., ranking was carried out within districts and comparisons were generally not made between study lands in different districts. The only exception was in the case of nationally special or rare vegetation types and plant species.

3. Bioclimatic zones were used as a further subdivision for assessment/ranking within each ecological district. The following bioclimatic zones occur within the study area: coastal, semi-coastal, lowland, submontane, montane, subalpine and alpine. These zones were defined, using indicator plant taxa, at an early stage of the study.

4. Basal geology, soils and land forms were not used as a further level of subdivision within ecological districts for ranking in the planning study. This was due to the broad scale of the study. However, these are important factors to consider with any comprehensive conservation assessment of indigenous vegetation and other natural features.

5. The basic unit of ranking was, where possible, vegetation type (cf. Atkinson 1985).

6. Threatened species, where known to exist, are acknowledged in the ranking process as they are often close to being lost from the gene pool. It must be noted, however, that some species have always been only rare or uncommon because of very restricted habitat and their present distributions may reflect a longstanding historical situation.

7. Rankings were based on botanical conservation value regardless of land tenure and management status.

8. The assigning of ranks was regarded as being a sieving process. Areas were `sieved' through the various criteria, starting at the 'top' (Exceptional), until they conformed to at least one criterion. All criteria within a particular rank level were regarded as having equal weighting.

9. The ranking process assigns a relative measure of importance for nature conservation based on botanical values only. It is not a priority ranking for management. To rank in a meaningful fashion for management many other factors would also have to be taken into account;

   (i) the degree of modification by introduced browsing animals (past and present)
   (ii) existing fencing, and physical limitations to fencing
   (iii) fragility (vulnerability to actual or potential threats)
   (iv) threats (e.g., wind exposure, fire, mineral extraction, browsing animals)
   (v) access
   (vi) boundaries
   (vii) adjacent land use and tenure.

10. This type of assessment is applicable to areas of indigenous vegetation, mosaics of indigenous and exotic vegetation types and mixtures of indigenous and exotic plants. ' Primary' and ' regrowth' vegetation types were regarded as having equal standing; i.e., representative examples of the vegetation of an ecological district should include representation, where possible, of

district.

11. The ideal situation for this type of assessment is to be able to identify priority natural or largely natural areas comprising the full range of vegetation types, landforms and soils within each ecological district throughout New Zealand. The `full range' of vegetation types is regarded as applying equally to primary and secondary vegetation types at all stages of development.

12. The ranking is based entirely on botanical values. No account was taken of other biological features, such as indigenous fauna, which could significantly alter (raise but not lower) a ranking for **nature conservation** value.

13. The rankings were based on currently known information. Rankings for many study areas may and probably will change with increasing knowledge.

14. More work is required on conservation value rankings and area. For example threatened plant taxa are significant criteria but there are no guidelines for assessing how large an area should receive a particular rank based on their presence.

APPENDIX 2

Ecological Area Selection Criteria

The following criteria were first developed by the Scientific Co-ordinating Committee for Beech Research and were used in the selection of ecological areas (cf. Bassett and Miers 1984):

1. It should represent the full range of land forms, soil sequences, animal communities, and unmodified vegetation of the ecological district. The inclusion of some modified vegetation may sometimes add to the value of an ecological area.

2. It should be large with, say, a minimum of 1,000 ha; a single large reserve is preferable to two or more smaller reserves of the same total area. This is particularly true for preserving the greatest diversity of bird populations.

3. It is considered legitimate to create small reserves to preserve unique features or special values, although these could present special problems in protection.

4. It should include at least one complete undisturbed catchment of a permanent waterway.

5. It should have a compact shape, with the minimum perimeter for the area involved.

6. Wherever possible, its boundaries should be clearly defined by natural features.

7. It should be unroaded, at least within the main catchment.