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## Beyond “Hotspots”: How to Prioritize Investments to Conserve Biodiversity in the Indo-Pacific Region

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### Introduction

The forested habitats of the Indo-Pacific region are among the most species-rich on Earth but face severe threats from deforestation (Myers 1988). Erosion of biological diversity in the Indo-Pacific is directly linked to deforestation; with few exceptions, nearly all of this region was once forested. Remaining forests and other natural habitats vary in richness, requiring strategies to establish priorities to conserve the most important areas. Two such approaches, “ecological hotspots” (Myers 1988) and “mega-diversity countries” (Mittermeir & Werner 1990), use lists of plant species or other taxa to identify biologically rich biogeographic units or countries. However, these largely descriptive efforts lack a paradigm to establish conservation priorities at regional, national, and subnational levels. They fail to incorporate the size or location of existing parks, to identify gaps, or to quantify conservation potential and threats for biologically rich countries or protected areas.

We present a new approach to conservation planning to address these concerns: a conservation potential/threat index (CPTI). The index forecasts how deforestation during the coming decade will affect conservation or establishment of forest reserves. The index compares biological richness with reserve size, size of

protected areas, size of remaining forest cover, and deforestation rate. We provide examples for regional, national, and subnational geographical scales to indicate the broad usefulness of the CPTI for setting priorities for conserving biological diversity. Second, we analyze the size of protected areas in the region by country and by biogeographic unit because conservation of biological diversity, from populations to entire ecosystems, will be most successful in large reserves (Schoenwald-Cox et al. 1983; Redford & Robinson 1991). From our analyses we identify where reserves are most needed and how funding can best be invested to finance effective conservation action.

### Methods

#### Geographical Scope

Relevant reviews of protected areas have treated the Indo-Malayan realm and the South Pacific islands separately (IUCN 1986; MacKinnon & MacKinnon 1986), but we considered both regions together in our analysis because funding agencies often administer the two regions as a single unit (for example, the World Bank, the World Wildlife Fund, IUCN). We used national rather than biogeographic units for our analysis because (1) conservation planning and financing by donors, conservation

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agencies, and foundations are generally country-specific; (2) projects are usually implemented at the national level; and (3) a number of biogeographic units constitute national or administrative units as well, especially among the island nations in Asia and the South Pacific (see IUCN 1986; MacKinnon & MacKinnon 1986). We include for consideration 23 countries (Appendix A) in the Indo-Malayan realm and the South Pacific (hereafter referred to as the Indo-Pacific countries). Hong Kong, Singapore, and the Maldives Islands were excluded from this analysis because of their negligible forest cover.

## Sources for Data

The legal status of protected forested habitats varies considerably among countries. Our base data are from the International Union for the Conservation of Nature and Natural Resources [IUCN] (1990, 1991). The list of protected areas is updated for Malaysia by the Malaysian Forest Department Working Paper (personal communication), for Indonesia by MacKinnon (1990), and for the Philippines by the Integrated Protected Areas System plan (C. Roque, personal communication). For Papua New Guinea, we include the terrestrial wildlife management areas, although they are not recognized by IUCN (1990). We consider small reserves to be those less than 300 km<sup>2</sup>, intermediate-sized reserves to be between 300 and 1000 km<sup>2</sup>, and large reserves to be 1000 km<sup>2</sup> or more (Appendix A). We base this designation on results of other studies that address reserve size and minimum viable population size for mammals (Redford & Robinson 1991) and on our own analysis of the distribution of reserve size in the Indo-Pacific (see Fig. 1).

Estimates of remaining forested habitat cover are drawn largely from MacKinnon & MacKinnon (1986) for Indo-Malayan countries unless superseded by more recent data (for Indonesia, MacKinnon [1990]; for Malaysia, Forestry Department of Malaysia [personal communication]; for the Philippines, SSC [1988]). Data for the South Pacific countries are from IUCN (1986). In several instances, FAO (1981) data for forest cover in each country were higher than data from MacKinnon & MacKinnon (1986), partly because of

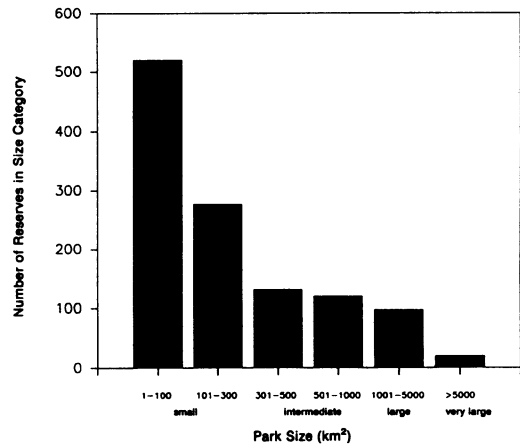


FIGURE 1. Size distribution of protected areas in 23 countries of the Indo-Pacific region.

differences in classification of forest types. We chose to use the MacKinnon & MacKinnon (1986) data in these situations because their estimates were more conservative, were field-based, and used consistent criteria across the Indo-Malayan region.

Deforestation rates for all Indo-Malayan countries, Papua New Guinea, Fiji, and the Solomon Islands are from the World Environment Report (WRI 1990) and McNeely et al. (1990). We lack data on deforestation rates for New Caledonia and Tonga, so we assumed these nations to have the same rate as Papua New Guinea. These rates, particularly for New Caledonia, may be underestimates (IUCN 1986).

## Construction of Conservation Potential/Threat Index (CPTI)

We assumed that park coverage (expressed as percentage of country under formal protection) and deforestation rates will remain constant during the next 10 years. In this analysis, forest cover includes all natural habitats with substantial tree cover, such as scrub jungle, open woodland, swamps, and mangroves, and is not restricted to closed-canopy forests. To standardize the analysis, we use percentage of remaining forest cover rather than absolute forest cover to rank countries regardless of their size.

The amount of remaining forested habitat projected in 10 years time was calculated by subtracting the amount of forest lost during the