INTRODUCTION

Forests covered most of the land area in Sabah until human activities resulted in the conversion a large part of them, principally to agricultural land in the last few decades. Natural forests in Sabah can be broadly divided into the following types (Fox, 1972):

1. Lowland and Hill Dipterocarp Forests
2. Lower Montane Forests
3. Upper Montane Forests
4. Swamps
   4.1 Mangrove
   4.2 Peat Swamp
   4.3 Fresh Water Swamp
   4.4 Riparian
5. Beach Forest
6. Forests on Limestone
7. Heath / Kerangas Forests, including forests on ultrabasic rocks
8. Secondary Forests

Forested areas, i.e., areas covered by trees, are managed for a wide range of products and services. Briefly, the products and services from the forests are:

- Wildlife (plants and animals)
- Watershed
- Soil protection
- Timber and non-timber forest produce
- Recreation

In this paper, the current status of management of the tree flora component of the forest will first be described, followed by the issues and challenges that have been identified.

MANAGEMENT OF TREE FLORA: CURRENT STATUS

The following aspects of the management of the tree flora of Sabah will be discussed: present status of forested land; plant specimens in herbaria and living collections of trees, publications on tree flora; and government bodies involved in the management of tree flora.
Present Status of Forested Land

Of the total land mass of 7.3 million hectares in Sabah, about 3.49 million hectares have been constituted as forested areas, as shown in Table 1.

Table 1. Gazetted Forested Areas in Sabah (Source, Sabah Forestry Department)

<table>
<thead>
<tr>
<th>Area (hectares)</th>
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<tbody>
<tr>
<td>FOREST RESERVES</td>
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<tr>
<td>Class I – Protection Forest Reserve</td>
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<tr>
<td>Class II – Commercial Forest Reserve</td>
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<tr>
<td>Class III – Domestic Forest Reserve</td>
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<tr>
<td>Class IV – Amenity Forest Reserve</td>
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<tr>
<td>Class V – Mangrove Forest Reserve</td>
</tr>
<tr>
<td>Class VI – Virgin Jungle Reserve</td>
</tr>
<tr>
<td>Class VII – Wildlife Reserve</td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
<tr>
<td>PARKS (FORESTED AREAS)</td>
</tr>
<tr>
<td>Kinabalu Park</td>
</tr>
<tr>
<td>Tunku Abdul Rahman Park</td>
</tr>
<tr>
<td>Turtle Island Park</td>
</tr>
<tr>
<td>Pulau Tiga Park</td>
</tr>
<tr>
<td>Tawau Hills Park</td>
</tr>
<tr>
<td>Crocker Range Park</td>
</tr>
<tr>
<td>Subtotal</td>
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<tr>
<td>Total</td>
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</tbody>
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These figures do not include areas that have been proposed as conservation areas, e.g., the proposed Lower Kinabatangan Wildlife Sanctuary. In addition, some of the state land and alienated land are still covered by some form of forest, although legally these need not to be maintained as forested land.

Apart from some of the parks and some virgin jungle reserves, the legally gazetted forested areas have been disturbed by logging and other human activities in the past and present. In particular, within the commercial forest reserves managed principally for the production of timber, most of the forests are now devoid of merchantable timber species due to the unsustainable practices carried out in the past.
Plant Specimens in Herbaria and Living Collections

In Sabah, the following institutions have built up and maintain collections of preserved and living plants (including trees):

- Forest Research Centre of the Forestry Department, which has a herbarium with about 250,000 specimens and an arboretum
- Sabah Parks which keeps a collection of plant specimens collected within the parks
- Agriculture Department whose research centre and stations maintain living and preserved specimens of fruit trees, orchids and agricultural crops
- Sabah Museum which has a collection of preserved and living plants that are of ethnobotanical interest
- Institute of Tropical Biology and Conservation of Universiti Malaysia Sabah, which has begun to build up the herbarium

These institutions play the leading role in the research on the tree flora in Sabah, and produce findings which form the basis for the management of the tree flora.

Publications on Tree Flora

The diverse flora of Sabah has attracted naturalists from many parts of the world, particularly Europe and North America. One of the major taxonomic research work on plants in the world, the Flora Malesiana Project, coordinated by the Rijks Herbarium at Leiden, the Netherlands, has produced monographs on numerous plant groups, including tree flora, in the Malesian region (defined as all the islands in South-east Asia and the Malay Peninsula). A regional programme which has produced a multi-volume handbook of useful plants in South-east Asia is the Plant Resources of South-east Asia (PROSEA) Programme.

At the national level, under the auspices of the Tree Flora of Sabah and Sarawak Project, three volumes of the Tree Flora of Sabah and Sarawak have been published (Soepadmo and Wong, 1995; Soepadmo et al., 1996; Soepadmo and Saw, 2000). Five more volumes have been planned. Earlier publications on the tree flora of Sabah which need to be updated are the Dipterocarps of Sabah (Wood and Meijer, 1964) and the Trees of Sabah (Cockburn, 1976, 1980). A widely used checklist of the tree flora of Sabah has been revised recently (Lee and Fox, 1999).
Government Bodies Involved in Management of Tree Flora

The following government organisations, are directly involved in the management of tree flora in Sabah: Forestry Department, Sabah Parks, Wildlife Department, Environmental Conservation Department and Sabah Biodiversity Centre (yet to be set up). In a nutshell, the roles of these bodies, according to the provisions in the legislations, are as follows:

- Forestry Department is responsible for the management of ‘forest produce’; with the implementation of sustainable forest management, other forest products and services, as well as the needs of local communities, are also given due consideration.

- Sabah Parks is responsible for the conservation of the biological and physical resources found within the parks and ecotourism within the parks.

- Wildlife Department is responsible for the management and conservation of wildlife which includes fauna and flora.

- Environment Conservation Department is responsible for conservation and management of the environment, including tree flora.

- Sabah Biodiversity Centre will be responsible for the management of the biodiversity, including tree flora.

ISSUES AND CHALLENGES

In the context of management of the tree flora in Sabah, the following issues and challenges have been identified: sustainability of timber production, management of endangered species, human resource development, coordination of work

Sustainability of Timber Production

For more than three decades since the independence of Sabah in 1963, revenue from timber has been one of the main sources of income for the State Government. However, in the past few years this source of revenue has decreased drastically, and the trend will continue with the depletion of the timber resource due to the unsustainable forest harvesting practices in the past. Although sustainable forest management licence agreements have been entered into by the State Government and selected companies for the management of the commercial forest reserves, timber revenue is not expected to increase in the foreseeable future because our present state of knowledge shows that it is not commercially viable to carry out reforestation in badly degraded forests.

The challenge for the State, as far as timber production is concerned, is turning the badly degraded commercial forest reserves back to revenue-generating productive forests again.
Management of Endangered Tree Species

For the management of the commercial forest reserves for timber production, practically no consideration is given to the need for conservation of endangered tree and other plant species. The trees are merely classified into timber groups.

When the present forest reserves were gazetted in the 1980’s (with subsequent minor changes), no consideration was given to the need to conserve the rare and endangered plant species, although some data were available then. For example, rare and possibly endangered dipterocarps have been documented as early as 1964 (Wood and Meijer, 1964). Even the samples of virgin forests gazetted as virgin jungle reserves and supposed to be conserved as virgin forests have been logged and often badly damaged. A survey on the virgin jungle reserves show that most of them have been logged and are now dominated by belukar (secondary forest) species.

Many plant species, including trees, in Sabah are now known to be rare and endangered. The list of species is expected to become longer as research on the flora is intensified. The challenge for us is the conservation of these rare and endangered species, and to record as much of the plant taxa as soon as possible before they become extinct and so that they can be properly managed.

Human Resource Development

Management of the tree flora in the biologically diverse tropical forests requires expertise in the fields of plant taxonomy, forest ecology, forest harvesting and others. One of the main reasons why our forests are now in the degraded state is the lack of expertise in these areas. Can forest managers acquire sufficient expertise and utilise it to stop further degradation of our forests? This is another challenge.

Coordination of Work

As explained earlier, there is a lot of overlap among several government organisations in the management of tree flora of Sabah. In view of the limited human and other resources in Sabah, there is a need for better coordination of the work of the various government bodies involved in the management of tree flora of Sabah.

The coordination of work among the various organisations to optimise the use of limited resources is another challenge.

CONCLUSIONS

Management of the biologically tropical rainforest ecosystems in Sabah, with trees as the dominant component and with numerous stake holders, is a complex process. The present status and the challenges in the management of the tree flora component of the forest are discussed in this paper. Restoration of the degraded forests is a herculean task for forest managers in Sabah.
REFERENCES


Wood, G.H.S. & W. Meijer (1964) *Dipterocarps of Sabah (North Borneo)*. Sabah Forest Records No. 5. Forest Department, Sabah.