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Resource Inventory and Conservation Aspects in Tropical Vegetation

A.N. GILLISON

Over the past decade, the momentum of resource exploitation in the tropics has increased, in many cases to an unacceptable level. The problem concerns the physical removal of non-renewable resources. A conspicuous feature is the removal of tropical woody vegetation, sometimes involving the complete and irreversible destruction of a regional biome.

To effectively manage the resource there must be a continuing effort to inform political decision-makers. The extent of the resource must be determined, the primary environmental determinants of the resource identified, and the best way of managing the resource established.

This paper sets out to define the important terms and concepts used in relation to the tropical vegetation resource, to review briefly the existing methods of field estimates, and to present a case for an improved approach to field survey and vegetation classification methods. Some case studies are drawn from the Australian region.

Definitions

The term *resource* refers to a material quantity which may be exploited to satisfy either material or non-material (aesthetic) requirements (Usher 1973; Allaby 1977). Qualifying terms, such as "finite", "renewable", "potential", and "diminished", tend to be used in a uniform way in literature and require no further definition here.

Inventory is a term used to define limits to a resource. Resource inventories are a function of the parameters and attributes used to describe them, and because these vary from place to place, the final data may not always provide inventories which can be uniformly compared. Description and classification are integral parts of the inventory process. The descriptive phase is the recording of data, and classification is the ordering of such data into meaningful patterns. The last usually employs analytical methods which vary according to circumstance.

Allaby (1977) has defined *conservation* as "the planning and management of resources so as to secure their wise use and continuity while maincriticized by Meijer (1970) who maintains that many removal procedures are pointless. He also says that the degree of disturbance is critical in determining the final composition of the rainforest. He was able to detect stands dominated by the secondary species *Anthocephalus chinensis* in areas logged more than forty to forty-five years before. Other disturbance effects have been discussed by various authors (Richards 1955; 1966; Jones 1956; Conklin 1957; Budowski 1965; 1970; Fox 1973; Gillison 1975a, b; Hopkins and Graham 1981), from which it can be concluded that the advanced growth of secondary species makes it difficult to distinguish between old secondary forest and primary or climax forest. Gillison (1975b) has emphasized that if one is to "restore" an altered tropical forest ecosystem, it is desirable that some classification of the former unaltered status is available as in many cases restoration may simply mean a return of tropical forest to an advanced seral stage — not that this is necessarily undesirable. An indication of a typical example of forest succession following disturbance is described by Hopkins (1981) for a TMF in Queensland (Fig. 11.3).

From the above, it should be evident that because of the calibration of many inventory processes to static rather than dynamic systems, there is much meaningful information lost, particularly where disturbance or perturbation has taken place. The kinds of successional stages described by Symington (1933), Budowski (1965; 1970), Gillison (1970), Gomez-Pompa and Vasquez-Yanes (1974), Fontaine and Gomez-Pompa (1978), and Ashton *et al.* (1978) suggest there are distinct behavioural and strategical characteristics of plant response to changing environment that can be used to identify characteristic states of forest type. To some extent this has already been considered by several authors, for example, the "nomad" and "dryad" species of van Steenis (1958), and certain "vital attributes" which have been suggested by Noble (1981).

Other limitation of classificatory systems are the rigidity or arbitrariness of classes and more particularly the subjectively based criteria for attribute selection. Very rarely have attributes been experimentally validated for use in forest classification. Rollet (1978) and others have discussed at length the difficulty of employing the recognition of strata or layers within rainforest as classificatory attributes, and it is certain there are major difficulties both in layer recognition and in subsequent numerical analyses of the data. Even terms such as *sclerophyll*, *xerophyte* and so on are elusive of adequate quantitative definitions.

In this respect, the extension of life-form classes proposed by Ellenberg (1956) and Ellenberg and Mueller-Dombois (1974) are limited when used in classifying, for example, complex forest types. Further, the system of drawing forest profiles is a useful descriptive technique but data from this source can rarely be used sensibly in numerical analyses. Finally, the appli-