Chapter one

Setting the scene

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1.1 Nature conservation in the world today

A lot of attention is currently focused upon the conservation of nature. For example, an international biodiversity treaty was recently signed by many countries in Brazil (UNEP, 1992), and a compendium that covers many of the known elements of biodiversity was published in association with that treaty (World Conservation Monitoring Centre, 1992). A number of publications have focused upon the most practical and effective strategies for the conservation of nature (e.g. Decker *et al.*, 1991; McNeely *et al.*, 1990; WRI *et al.*, 1992; Soule, 1991); in addition, a recent volume addresses the policy and strategy issues related to the conservation of biodiversity (WRI *et al.*, 1992). The broad scope of biodiversity conservation is well represented in the Global Biodiversity Strategy (WRI *et al.*, 1992, Figure 5). This book is a presentation of some methods currently being used globally to map nature. These methods include prime examples of approaches that employ databases and maps as conservation planning and monitoring tools.

A deluge of information is in circulation in all portions of the management and policy-making arenas. The people in these realms do not have the time to read everything that comes across their desks and, under these conditions, text is not an effective means for communicating important subjects – particularly when an immediate response is required. Maps are powerful vehicles for communicating information. Using only bits of capsulized text, maps permit us, visually, to convey important information about the status, and sometimes the dynamics, of species, habitats and natural resources.

Conservation biology is an interdisciplinary field that incorporates a wide range of disciplines (Temple, 1991). This interdisciplinary perspective is essential for coping with the host of issues that influence the implementation of integrated conservation strategies. A diversity of objectives that are part of these strategies can be met through the use of species and habitat maps.

A focal point of some recent discussions is the contrast between strategies that focus upon species-by-species conservation, ecosystem conservation and biological community conservation (e.g. Hutto *et al.*, 1987; Seal *et al.*, 1992). This book presents approaches used by some of the foremost active conservationists in the world today. The common theme that links these programs is the highly practical character of the approaches that they all employ. The protection of nature in general, rather than

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concern for the protection of one natural element versus another, is the principle overriding all these programs. For example, the panda conservation strategy in Chapter 8 is a species-specific project. However, this strategy necessarily must consider a wide range of factors that affect panda populations. These factors include panda biology, distinctive species-specific bamboo flowering cycles, and human population settlement patterns. Each of these elements must be considered for the successful implementation of a practical panda conservation plan. Conservation strategies must be tailored to the circumstances in each specific area of the world. Sometimes this will require conservationists to focus upon species-specific factors and sometimes ecosystem protection factors.

The chapters of this book present many examples of different functions for maps in conservation. These are 'real-world' applications of approaches that use databases and maps to depict the spatial distributions of species, human populations, landscape features, habitats, migration routes, etc. These approaches do not attempt to model structures and processes in the natural world. A recent book presents an excellent overview of current spatial modeling approaches as they can be applied to ecological systems (Hunsaker *et al.*, 1993). Another recent book reviews applications of the Geographic Information System (GIS) to landscape ecology (Haines-Young *et al.*, 1993). The approaches introduced here represent applications developed with the intention of influencing the design, planning and implementation of programs to protect species and habitats.

1.2 Natural features data

On a map boundaries of structural features (i.e. features created by humans) are far more precisely definable than the boundaries of natural features. The boundaries of structural features are discrete and they can usually be precisely located on a map using a combination of point, arc and polygon coordinates. However, the boundaries of most natural features (e.g. species and habitat distribution patterns) are not usually definable in this same way. The movements of animals are not precisely predictable from one moment to the next. The boundaries of habitats change regularly due to the effects of climate, succession, disturbance, etc.

In addition to the potential imprecision of feature boundaries, any single map represents only one of many possible cartographic views of a variable or set of data (Monmonier, 1993). Therefore during the production of species and habitat distribution maps, the authentic depiction of the data should always be carefully considered.

1.2.1 Data variance

A basic characteristic of structural organization in the natural world is the wide variety of climatic, geologic and topographic features. The data that define the status of these ecosystem elements consequently exhibit a particularly wide range of variation. Therefore the variability of ecological data significantly influences the ability of scientists to cogently map natural features.

The data required to produce the maps presented in this volume extend across a broad spectrum of heterogeneity (Figure 1.1). A number of data attributes delineate this heterogeneity including data type, quality, density and precision. The most appropriate mapping technique is often based upon the data intensity that needs to be represented on a map. Consequently, approaches vary across a spectrum between (i) the representation of features on a map with the data registered to coordinate values; and (ii) features on a map presented with only generalized localities and not registered to a coordinate system.