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INTRODUCTION

Special section: valuation and management of fynbos ecosystems

The quantification and appreciation by society of the services provided by natural ecosystems provides a very powerful incentive for their conservation (e.g. Daily, 1997). This is especially true of developing countries which harbour a disproportionate amount of the world's biodiversity, and where human needs may often be in conflict with preservation ideals. These conflicts may, however, be resolved by analyses that incorporate ecological and economic processes (Costanza et al., 1991; 1993).

The South African fynbos exemplifies the plight of species-rich ecosystems under severe threat as a result of limited resources being directed from conservation-related activities to social upliftment programmes. Fynbos, a chaparral-like shrubland, is the principle vegetation of the Cape Floristic Region (Cowling, 1992). This region, occupying a mere 90 000 km^2, supports 8500 plant species (of which 68% are endemic), 193 endemic genera and six endemic families (Bond and Goldblatt, 1984). The flora is under severe threat, principally from invasive alien trees and shrubs which reduce native biodiversity and disrupt ecosystem processes (Richardson et al., 1992).

Fynbos ecosystems provide a wide array of valuable ecosystem services, including a thriving wildflower trade, ecotourism opportunities, biodiversity storage, and about two-thirds of the region's water requirements (Cowling et al., 1997). Alien plants substantially reduce the value of these services: e.g. by massively increasing biomass in a watershed, they cause a decrease in run-off of between 30 and 80% (Le Maitre et al., 1996). Clearly, the challenge facing conservationists was to convince policy makers and the broader community that the allocation of funds for the management of fynbos ecosystems makes sound economic sense. What was needed was a good dose of ecological economics. Since this capacity was lacking among the local community, Robert Costanza, of the University of Maryland, agreed to bring his skills to the fynbos.

Robert Costanza and five colleagues visited South Africa in July 1995 to conduct a two-week workshop on ecosystem valuation, with special emphasis on fynbos (see Ryan et al., 1996 for details). The meeting, co-hosted by the University of Cape Town's Institute for Plant Conservation and the FitzPatrick Institute, was attended by more than 40 delegates from a wide array of backgrounds, including four universities, two research institutions, two government departments, two conservation agencies, one regional authority, one NGO and one consulting agency.

The four papers in this special section are products of this workshop. The first paper (Le Maitre et al.) is a survey of the attitudes of school pupils to the value of fynbos, before and after an educational presentation. The survey shows the importance of communication in determining attitudes of stakeholders towards a natural resource. The

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second paper (Joubert et al.) argues that multi-criteria decision analysis is superior to cost-benefit analysis as a tool for public sector decision making, especially in the developing world. They use the expansion of water provision schemes in species-rich fynbos catchments to illustrate their arguments. In the last two papers, Higgins et al. developed dynamic models that simulate both economic and ecological flows in fynbos systems. One paper estimated the returns from fire wood derived from alien trees subject to a biocontrol agent, relative to the potential income from wildflower production. The model demonstrates that the benefits of biocontrol can outweigh the costs (loss of fuel wood) provided the opportunities these benefits provide (e.g. wildflower cultivation) are exploited. The last paper presents a model that integrated ecological and economic processes in a hypothetical fynbos watershed. Water production and a biodiversity storage function were the most valuable ecosystem services. The model showed that the cost of clearing alien plants was a tiny proportion (0.6–5%, depending on management scenario) of the value of mountain fynbos ecosystems. This result provides a strong motivation for the injection of funds for clearing alien plants from fynbos-clad catchments.

The good news is that fynbos ecologists have convinced the South African Minister of Water Affairs and Forestry of the benefits of clearing alien plants from fynbos watersheds for sustainable water production. A massive programme of alien plant removal, launched by the ministry under the auspices of the Reconstruction and Development Programme (a broad-based intervention aimed at 'kick-starting' socio-economic development in post-apartheid South Africa), was initiated in late 1995. This 'Working for Water' Programme had a budget of US$ 25 million in its first year (half of which was derived from the private sector) and created 6000 jobs for ecological restoration workers.

What are the lessons for ecologists and economists? First, attempts to model ecological-economic systems are intellectually rewarding and a crucial step in developing sound policy. Second, important and charismatic ecosystem services (e.g. water from fynbos watersheds) can act as an umbrella for less directly valuable services. Third, when you have a good story, engage policy makers directly.

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