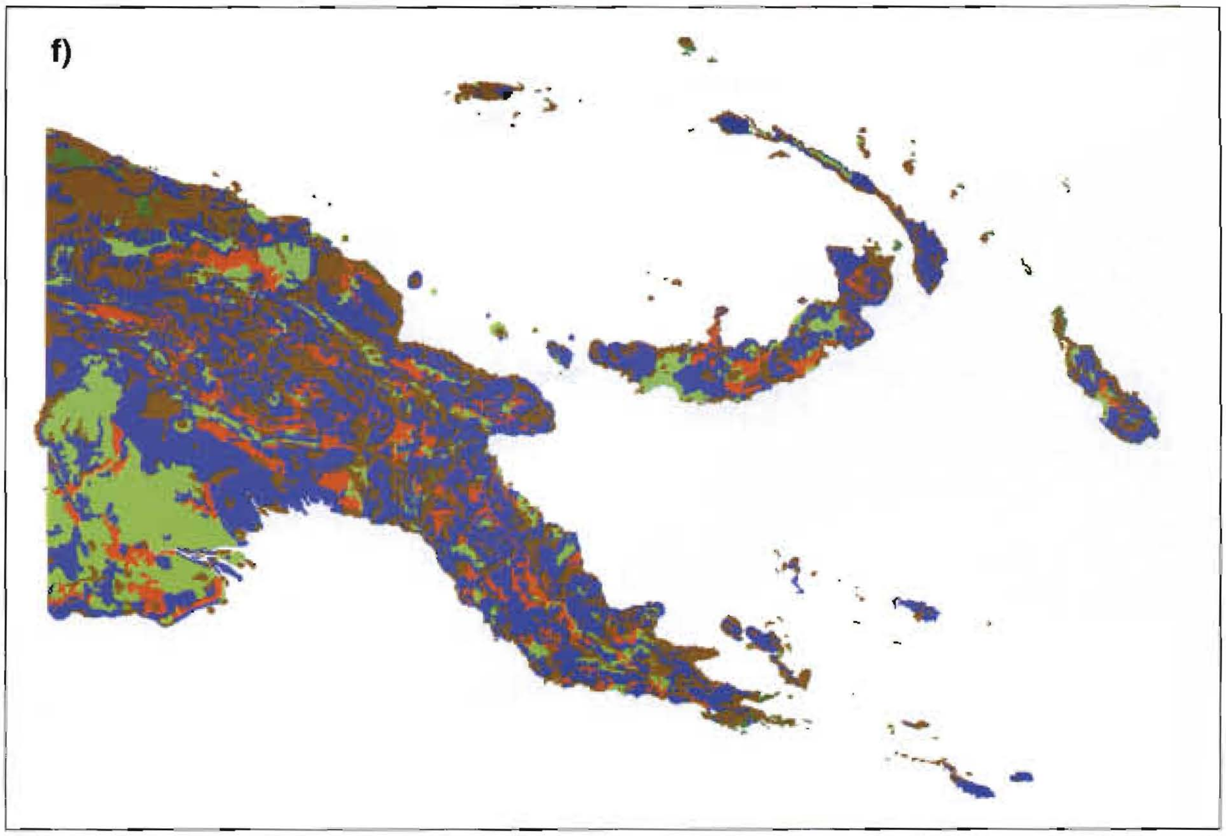
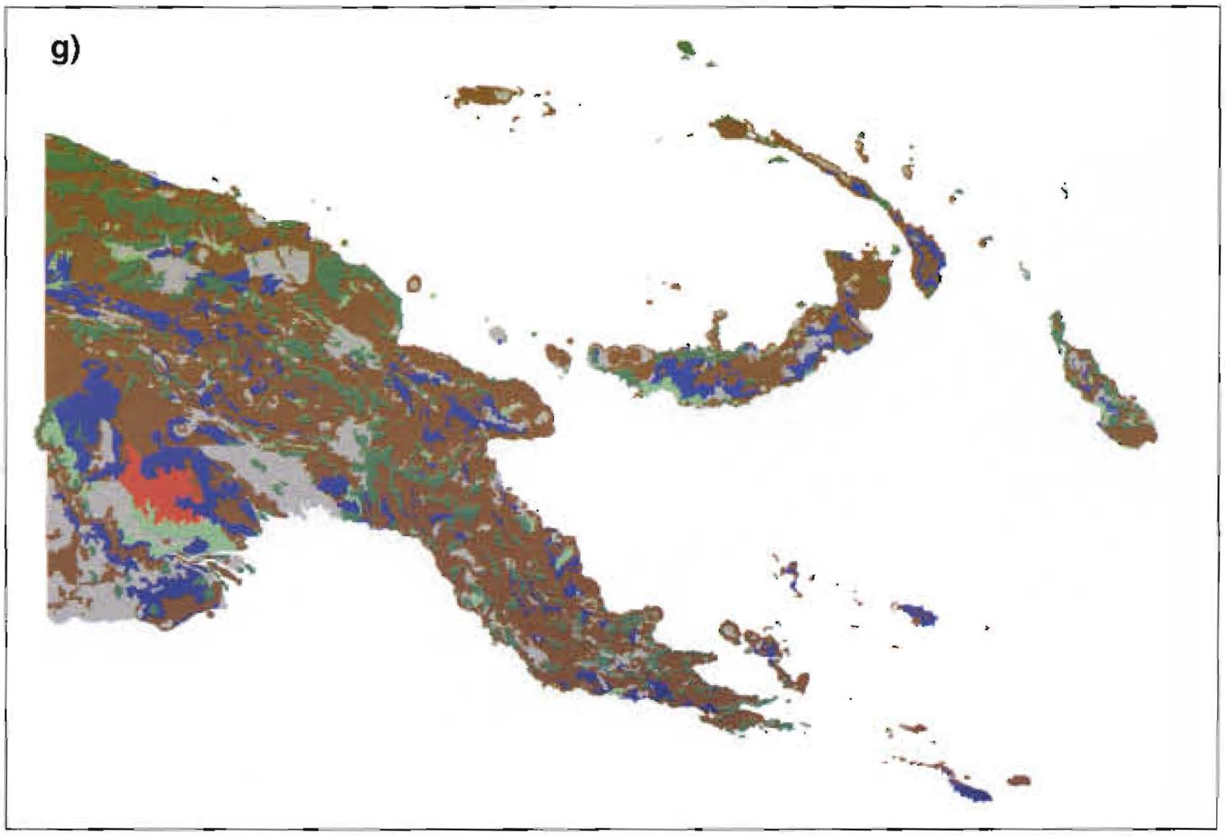


f) analysis for a 15%-based target, assuming a 0.999 probability of persistence goal for all attributes, with 0.10 current probability of persistence, and must-haves also assigned highest levy.



g) analysis for a 15%-based target, assuming a 0.999 probability of persistence goal for all attributes, with 0.10 current probability of persistence and assuming 0.90 probability of persistence for proposed protected set for the 10%-based target. Proposed areas are coloured grey and a levy is not calculated for these in this example.

Some future prospects for systematic biodiversity planning in Papua New Guinea — and for biodiversity planning in general

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We describe three challenges for biodiversity planning, which arise from a study in Papua New Guinea, but apply equally to biodiversity planning in general. These are 1) the best use of available data for providing biodiversity surrogate information, 2) the integration of representativeness and persistence goals into the area prioritization process, and 3) implications for the implementation of a conservation plan over time. Each of these problems is linked to the effective use of complementarity. Further, we find that a probabilistic framework for calculating persistence-based complementarity values over time can contribute to resolving each challenge. Probabilities allow for the exploration of a range of possible complementarity values over different planning scenarios, and provide a way to evaluate biodiversity surrogates.

The integration of representativeness and persistence goals, via estimated probabilities of persistence, facilitates the crediting of partial protection provided by sympathetic management. For the selection of priority areas and land use allocation, partial protection may be a "given" or implied by an allocated land use. Such an integration also allows the incorporation of vulnerability/threat information at the level of attributes or areas, incorporating persistence values that may depend on reserve design. As an example of the use of persistence probabilities, we derive an alternative proposed priority area set for PNG. This is based on 1) a goal of 0.99 probability of persistence of all biodiversity surrogate attributes used in the study, 2) an assumption of a 0.10 probability of persistence in the absence of any form of formal protection, and 3) a 0.90 probability of persistence for surrogate attributes in proposed priority areas, assuming formal protection is afforded to them.

The calculus of persistence also leads to a proposed system of environmental levies based on biodiversity complementarity values. The assigned levy for an area may change to reflect its changing complementarity value in light of changes to protection status of other areas. We also propose a number of complementarity-based options for a carbon credits framework. These address required principles of additionality and collateral benefits from biodiversity protection. A related biodiversity credits scheme, also based on complementarity, encourages investments in those areas that make greatest ongoing contributions to regional biodiversity representation and persistence. All these new methods point to a new "systematic conservation planning" that is not focused only on selecting sets of areas but utilizes complementarity values and changes in probabilities of persistence for a range of decision making processes. The cornerstone of biodiversity planning, complementarity, no longer reflects only relative amounts of biodiversity but also relative probabilities of persistence.

INTRODUCTION: PNG BIODIVERSITY PLANNING ISSUES

THE Papua New Guinea (PNG) conservation planning study using the current BioRap toolbox (Nix *et al.* 2000; Faith *et al.* 2001a,b) raised the natural questions of what might have been done differently, and what might be done next. An example of the former is the question of the quality of our nominated biodiversity surrogates — specifically whether we have made the best-possible use of available biotic data for biodiversity surrogate information. An example of the latter is the whole question of the practical implementation over time of a conservation plan. In between the two are other issues relating to the ongoing prioritization process, including the integration of the partial protection that might be afforded to some biodiversity features by areas used primarily for production activities. Partial protection is related to the broader problem of integrating representativeness and persistence/viability goals in prioritizing areas.

All of these questions and issues are linked to the effective use of complementarity. A probabilistic framework for calculating persistence-based complementarity values over time can contribute potential solutions to each problem. The first section below focuses on appropriate methods and later sections explore applications.

INTEGRATION OF PERSISTENCE AND REPRESENTATIVENESS

The PNG study addressed persistence in only an *ad hoc* way, through the discounting of small areas and small surrogate attribute occurrences (Faith *et al.* 2001a,b). If attribute occurrences of less than 1 km^2 had been counted towards representation in the course of selecting areas, the total cost to represent all biodiversity attributes would have been markedly less. So, a simple "counting-up" of biodiversity represented, ignoring viability, might be tempting. However, such seemingly successful trade-offs, and apparent regional sustainability,

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