A systematic method for identifying priority conservation areas using wildlife habitat relationships and observed locations of rare species

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INTRODUCTION

In an attempt to minimize the loss of biological diversity, large amounts of time, money, and effort have been focused on preserving natural habitats (Sinclair et al. 1995). Management and conservation planning decisions are required immediately to protect the greatest amount of biological diversity possible. Many different approaches have been developed to determine the best areas for conserving a desired species or subset of species (Margules and Redhead 1995; Faith and Walker 1996; Williams et al. 1996; Csutsi et al. 1997; Pressey et al. 1997). Some of these conservation-planning approaches are more efficient than others in their ability to identify a greater diversity of natural areas or species for conservation (Pressey and Nicholls 1989). The efficiency of identifying reserve systems is critical if the goal is to conserve the biological diversity of a region before the opportunities for reserve selection are limited by development. Because funds for conservation are insufficient to save everything, planning approaches must identify the optimum allocation of resources to save the maximum amount of habitat and species.

The habitat found in the south Okanagan and lower Similkameen valleys is considered one of Canada's three most endangered ecosystems (Bryan et al. 1994). Most ecological reserves, provincial parks, and wildlife management areas in these valleys were selected using an *ad hoc* approach. This approach has led to an uneven representation of natural features within the protected areas, thereby decreasing the potential for conservation of the biological diversity within the region (Pressey 1994). If the rate of habitat loss continues without protecting the essential habitats required to maintain populations, many species will be extirpated from the region (Noss 1994).

Our project applies a systematic conservation planning approach to the south Okanagan and lower Similkameen valleys to identify multiple-species conservation areas. The overall goal of this study is to identify priority areas for the conservation of the region's endangered and vulnerable biodiversity when different constraints are included in the selection process. These constraints include the economic, social, and biological factors that influence the selection of the priority sets of areas for conservation. The objective is to compare the priority sets of conservation areas with different constraints to identify the consequences of political, economic, or biological decisions on achieving explicit regional conservation goals.

CITATION —

Warman, L.D. and A.R.E. Sinclair. 2000. A systematic method for identifying priority conservation areas using wildlife habitat relationships and observed locations of rare species. *In* Proceedings, From science to management and back: a science forum for southern interior ecosystems of British Columbia. C. Hollstedt, K. Sutherland, and T. Innes (editors). Southern Interior Forest Extension and Research Partnership, Kamloops, B.C., pp. 141–4.

MATERIALS AND METHODS

The Ministry of Environment, Lands and Parks has developed extensive data sets for endangered and vulnerable species and habitats in the study area. The data consist of geo-referenced digital data sets that are compatible with Environmental Systems Research Institute Geographic Information Systems (GIS). The polygons identified in the 1:20 000 scale terrestrial ecosystem mapping of the study area are used as the site data for the selection of conservation areas. Biological data sets used to identify conservation criteria include:

- species occurrence data maintained by the Conservation Data Centre and by the local BC Environment office;
- 29 species habitat suitability models (Warman et al. 1998);
- rare plant community distributions (Warman 1997); and
- rare invertebrate inventory data provided by Dr. Scudder at the University of British Columbia.

The data sets that identify the constraints used in the analyses include:

- 1:20 000 scale TRIM data for roads and rights of way;
- land tenure information provided by BC Environment, LandData BC, and the Regional District of the Okanagan Similkameen; and
- resource uses identified by the ministries of Forests and Energy and Mines, and by the Agricultural Land Reserve.

The National Parks and Wildlife Service (NPWS) in New South Wales, Australia, has recently produced conservation planning software, called C-PLAN, to identify conservation areas in landscapes, which are subject to the effects of human development. C-PLAN is designed as a decision-support system which, together with ArcView (a GIS), maps the options for achieving explicit regional conservation goals. The C-PLAN algorithm selects areas of land or water in an iterative manner based on the extent or number of features that are located within a site. Features are defined as any attributes considered important for conservation, and can be physical, biological, or cultural. These attributes are used to calculate the irreplaceability values of a site, identify conservation targets, and select priority sites for conservation. Irreplaceability provides an objective measure used to identify sites that are essential for achieving explicit regional conservation goals. The selection method used in C-PLAN applies a complementarity approach. This approach builds on existing conservation networks, such as parks and protected areas, by selecting new areas with species or habitats not already adequately conserved in existing conservation networks. This procedure maximizes the conservation of biodiversity, at the least cost, for the area required or the location of the parcels of land relative to other land uses (Pressey et al. 1997).

RESULTS AND DISCUSSION

We determined the reliability of the wildlife habitat models using species occurrence databases maintained by the Conservation Data Centre and the Ministry of Environment in Penticton, B.C. Data sets consisted of presence data collected by both researchers and the public. Model reliability was measured by identifying the proportion of polygons in each habitat-rating category for every species habitat model that contained one or more occurrence records. The results indicate that the wildlife habitat-use predictions are reasonable since a greater proportion of the polygons rated as "high quality" in each of the species habitat models have species occurrence records (Figure 1). These are preliminary results, and therefore we have not determined the statistical significance of these data.

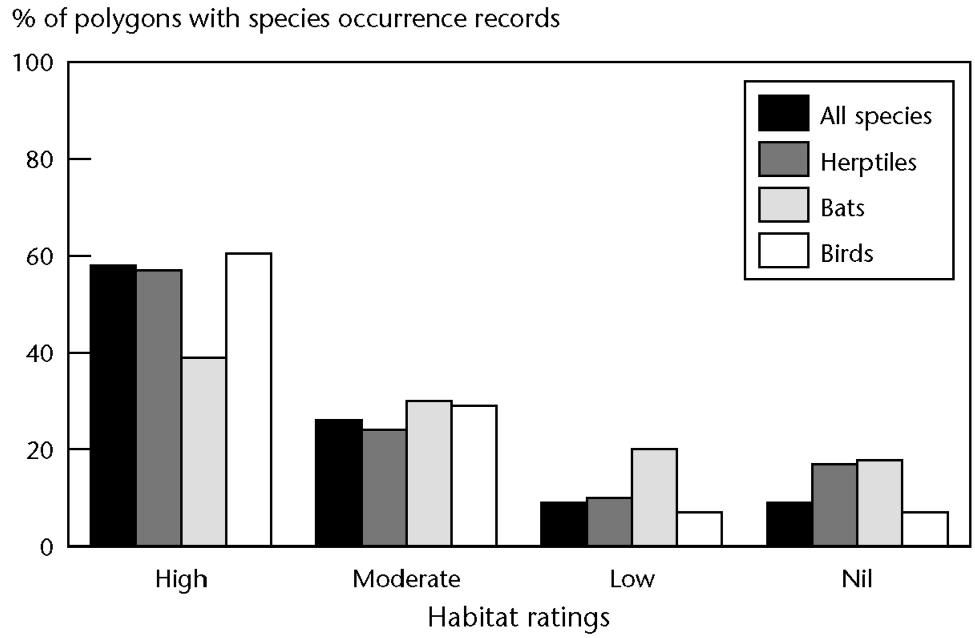

FIGURE 1 *Reliability assessment of the wildlife habitat models.*

The preliminary results from the analyses of priority conservation areas identified, as "highly irreplaceable," riparian, shrub-steppe, and grassland areas occurring in the valley bottom . These areas are in the greatest conflict with agriculture and urban development. In the next phase of the project, we will determine how the land tenure and agricultural zoning plans affect the conservation plans for the region.

The great advantage of this conservation planning approach is its ability to identify representative networks of reserves, which maximize the proportion of biodiversity conserved within a region. The systematic, defensible, and flexible plans that result are pro-active rather than reactive. Therefore, priority conservation areas can be identified before harmful effects occur. This will enhance our ability to lobby and negotiate with government agencies and industry. Efficient and defensible conservation plans are essential for the successful conservation of biota within this region. These plans must be considered for the conservation of the biota within the province, nation, and continent.

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