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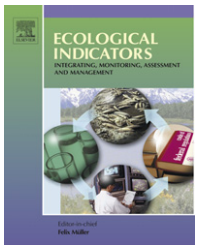

# Indicating disturbance content and context for preserved areas

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ABSTRACT

An accepted goal of conservation is to build a conservation network that is resilient to environmental change. The conceptual patch-corridor-matrix model views individual conservation areas as connected components of a regional network capable of sustaining metapopulations and biodiversity, and assessment of contextual conditions in the matrix surrounding conservation areas is necessary for planning. Context is often assessed in terms of fixed-width buffers surrounding conservation areas, but in practice, different locations within the same conservation area experience different contexts. We present an alternate approach for describing the landscape context of conservation areas, and we illustrate the approach by assessing vegetation disturbance measured by Landsat NDVI changes over a 4-year period for 51 conservation areas in the Apulia region of south Italy. Insights gained from a multi-scale assessment of disturbance, coupled with information about land use and habitat mosaics are necessary to understand the distinctive features of different preserved areas and thus, to formulate appropriate plans for a regional conservation network to maintain or enhance biodiversity in the region.



## 1. Introduction

The establishment of protected areas is widely recognized as being critical to nature and landscape conservation (WRI/IUCN/UNEP, 1992; Andelman and Willig, 2003; Waldhardt, 2003) Building a conservation network that is resilient to environmental change (e.g., land cover conversion, land use intensification or habitat fragmentation) is a primary goal of conservation (Noss and Cooperrider, 1994). One approach to planning is based on a patch-corridor-matrix model (Forman, 1995) that views individual areas as ''islands'' of habitat that are connected by habitat corridors such that all areas together constitute a regional habitat network capable of sustaining metapopulations or affecting regional biodiversity (e.g., Hanski, 1999; Opdam, 2002). With that model, the 'contents' of the network are described by landscape descriptions of patches and corridors, for example indices of existing biodiversity, land use and cover, and anthropogenic or natural stresses and constraints within the boundaries of conservation areas, and each area is deemed as spatially homogeneous with respect to those descriptors (Fig. 1).

In contrast, the ''context'' of conservation areas refers to the nature of the surrounding landscapes which may have important effects on what goes on within a park or a reserve (Janzen, 1983; Wiens, 2002). Context is important to biodiversity because at the patch level a community may depend on the patch quality which may be affected by patch boundary permeability and the neighbouring patch types (e.g., Andrén,

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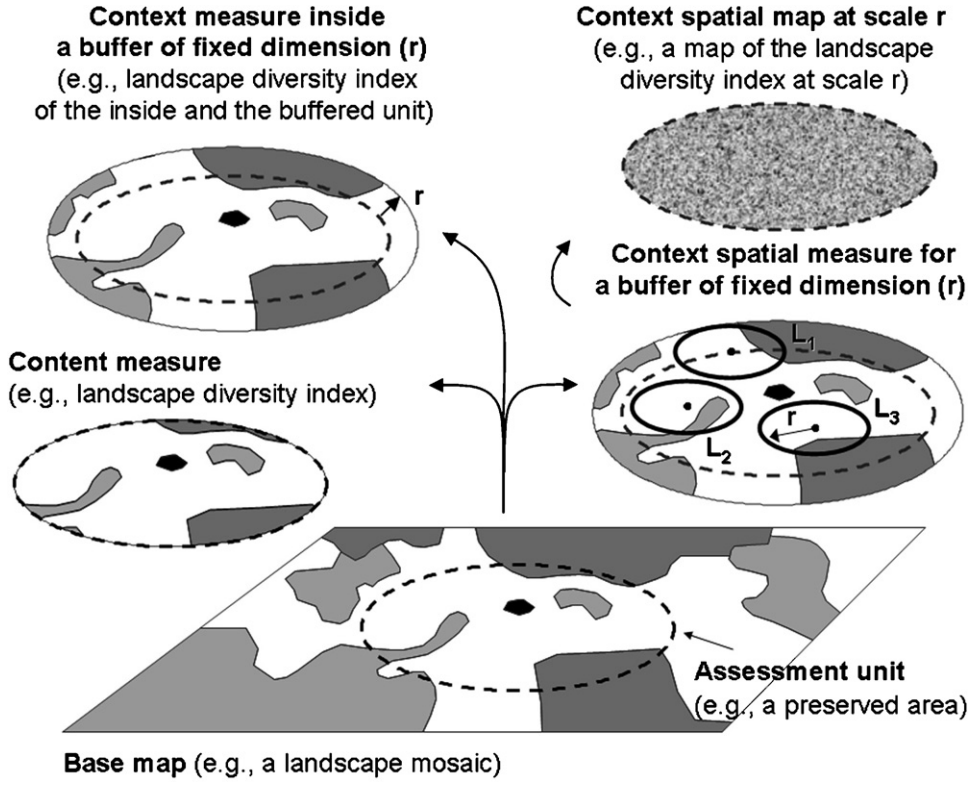


**Fig. 1 – The classical approach that describes the contents of a conservation area (i.e., the assessment unit; lower left) and its context (i.e., a fixed buffer assessment unit; upper left) in comparison to an approach that describes the context of each location within a conservation area (right). The methods employed in this paper uses the latter approach and accommodate multi-scale assessments by varying *r*, the size of the area over which context is assessed. In the figure the base map is a habitat mosaic and the assessment unit is described by a diversity index. Maps quantifying abiotic constraints, biodiversity descriptors, or agents of pressure could also be used. See text for additional discussion.**

1994). At the landscape level, the context, that could be envisioned as a 'buffer' around a site, may or may not help to maintain ecosystem functioning within a protected area, allowing animal and plant dispersal and gene flow (Hansen and Rotella, 2002) essential for population maintenance (Woodroffe and Ginsberg, 1998; Thies et al., 2003). Incompatible land uses (e.g., development), the spill-over of exogenous stresses (e.g., agricultural practices) (Rand et al., 2006), and edge effects such as impoverishment of vegetation and changes in biotic composition (Harper et al., 2005) are important even in the most remote regions of the globe (Laurance et al., 2002). DeFries et al. (2005) evaluated 198 tropical forest protected areas over a 20-year period and found that 25% of the areas experienced a decline in forest habitat area within the administrative boundary whereas 70% experienced a decline in the surrounding landscape extending 50 km from protected area boundaries. Assessment of environmental conditions in nearby unprotected areas helps to inform the creation and management of protected areas (Shafer, 1999; Margules and Pressey, 2000).

'Scale' is an issue when considering the context of preserved areas because context depends on how much of the surrounding landscape is included. When context is envisioned as a fixed-width buffer area surrounding conservation areas (e.g., DeFries et al., 2005), scale issues can be examined by changing buffer width to incorporate more or less of the surrounding area (Fig. 1). This approach describes differences between the regions inside and outside the conservation area, but it does not take into account potential differences within the same conservation area. For example, a location at the center of a conservation area experiences a different context in comparison to a location at the edge of the conservation area (Fig. 1).

A logical extension of a buffer analysis applied to an entire protected area is to identify a separate buffer or context for each location within a protected area (Fig. 1). Because this approach still imposes an arbitrary measurement scale (i.e., the choice of the buffer width), it would be even more informative to perform the buffering of all locations using a range of buffer widths (i.e., a neighborhood analysis with different window sizes). Depending on the buffer sizes considered, the size of the conservation area, and the proximity of a given location to the boundary of the conservation area, the context for that location may then include area inside and/or outside of the conservation area.

Landscape context and spatial scales are particularly relevant in highly developed regions where protected areas are geographically scattered and relatively small and where ongoing human activities and new land-cover types can be juxtaposed within increasingly fragmented native land-covers