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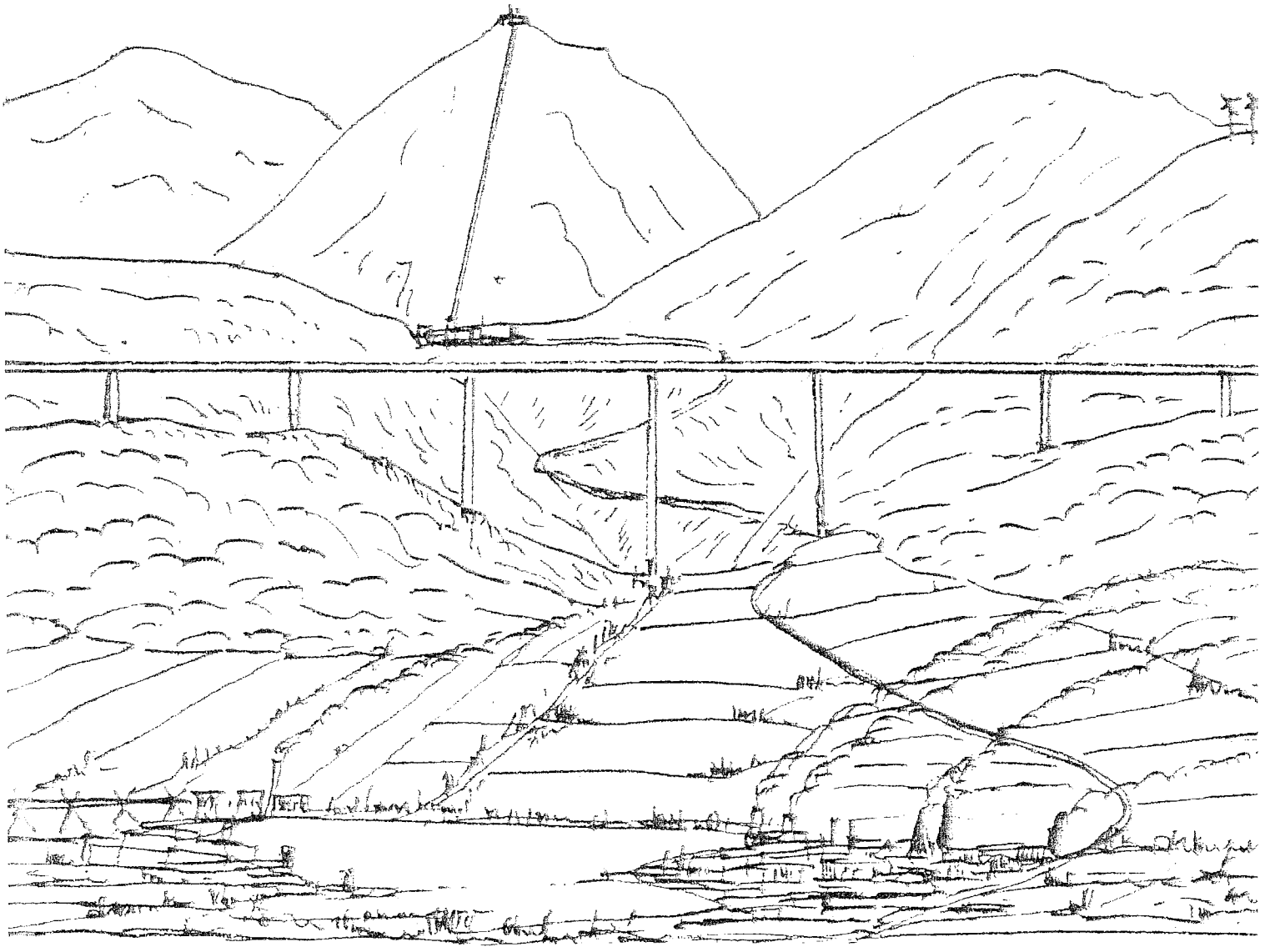

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Applicability of metapopulation theory to biodiversity conservation efforts in Greater Manchester

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Introduction

Natural and semi-nature habitats within urban areas are becoming increasingly fragmented, isolated, disturbed and homogeneous (McKinney, 2006; Ahern, 1995). Fragmentation and habitat loss are considered to be major causes of the decline in wildlife numbers and diversity. Hence, to prevent further decline it is important to preserve and/or develop areas that are large enough for populations of wildlife species to persist (Jongman, 1995). It is also necessary to recognise that conservation actions have to be taken outside designated reserves (Walker, 1995) so that possibilities for exchange of individuals, and hence genes, between sites are maintained and enhanced (Jongman, 1995).

An ecological network is a planning tool that can help maintain both structural and functional connectivity in the landscape (e.g. Bouwma *et al.*, 2002; Alterra, 2003) as it forms an interconnected spatial framework of areas of high nature value. An ecological network provides the physical conditions necessary for ecosystems and species populations to survive in a human-dominated landscape (Jongman and Pungetti, 2004). One of the rationales for grouping habitats into an ecological network of high connectivity is to provide for the specific needs of species forming metapopulations which depend on exchange of individuals for the survival of individual populations (Jongman, 2004). However, this rational can be questioned with regards to its applicability in urban areas and with respect to the observation that increased connectivity in the landscape may be unnecessary (Hobbs, 1988), ineffective (Henein and Merriam, 1984) or in some cases even detrimental to species not forming metapopulations (Simberloff *et al.*, 1992). Addressing these issues leads, in turn to questions about the application of metapopulation theory in urban areas, and about the feasibility of directing conservation efforts into creating ecological networks in the wider environment around designated areas.

Metapopulations and Ecological Networks in Greater Manchester – a case study

The authors report on a case study of the metropolitan area of Greater Manchester, UK. Greater Manchester is a densely populated conurbation (19.4 people per hectare) in the Northwest of England (National Statistics, 2007; ODPM, 2005). In this conurbation the identification and enhancement of an ecological network is being championed by the local planning authorities and promoted by ecological advisory bodies.

Following a critical review of the availability and relevance of data on the distribution and dispersal behaviour of species of special conservation importance in Greater Manchester the authors of this paper identify that there is a lack of empirical data relating to the occurrence of metapopulations for these species. The implications of these findings are considered within the context of the relevant wildlife conservation legislation and the planning process currently operational in England. In particular local authorities may not be justified in requiring a developer to conduct a protected species survey in the absence of a record for a particular species in a particular place. Further, local authorities also experience difficulties when trying to design and implement plans for an ecological network in the absence of empirical data.

There is, however, considerable evidence that structure and diversity within the green space of cities is of greatest importance in determining the species diversity of these areas

(e.g. Smith *et al.*, 2005; Sandström *et al.*, 2006). The authors provide an analysis of amount, distribution and ecological quality of publicly and privately owned green space within Greater Manchester. Combining this analysis with information on the dispersal potential of the species of conservation importance in Greater Manchester allows the authors to propose a framework by which the ecological processes can be sustained and the biodiversity can be maintained in densely populated conurbations.

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