

WILDLIFE IN THE RESTORED SEVESO SITE “BOSCO DELLE QUERCE”

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Introduction

The massive rate of anthropogenic habitat alteration has made landscape management a major topic in wildlife conservation. Long term species population persistence in human-modified landscapes largely relates to theoretical concepts such as metapopulation dynamics or source-sink dynamics (¹Pulliam, 1988; ²Hastings & Harrison, 1994). Species abundance in patches of a certain habitat type largely depends on the presence of those species in adjacent fragments of the same habitat type. Minimum Viable Population concepts have recently highlighted the importance of wide conservation areas for the persistence of a large number of species (³Soulè, 1987). The existing protected areas are proved to be too small for this attempt and the best strategy appears to be the creation of a network of protected areas connected by corridors and surrounded by buffer zones (⁴Harrison, 1992). In highly fragmented landscape the creation of corridors of suitable habitat is a very difficult goal, due to the presence of many barriers. In this kind of landscape the presence of stepping stones characterised by natural or semi-natural habitats appears to be one of the ways to make landscape more permeable to wildlife movements.

A typical example of fragmented landscape is offered by the morainic lowland North of Milano. This area is a very well defined geographical unit, bordered by the lower limit of Pre-Alps at the Northern side, by the limit of springs at the Southern side and by the Ticino and Adda rivers respectively at the Western and Eastern sides. The whole area covers about 2600 km². The presence of several woodland remains, together with wide urban plots in a cultivated matrix sets several questions directed toward a wildlife conservation oriented management.

Seveso lies almost in the middle of this lowland. Here a major chemical accident occurred in 1976, when highly toxic dioxin was released. Following the accident all the buildings and the vegetation on 40 ha were removed together with the soil. In 1985 habitat restoration started with the planting of oaks *Quercus* sp. and other broad-leaved trees. Our attempt was to highlight the ecological role of the restored site Bosco delle Querce within the wider area.

Material and Methods

To understand the occupation pattern shown by the Vertebrate fauna in Bosco delle Querce, we selected some groups characterised by different dispersal capability. Field data were collected both in the Seveso site and in a wider lowland area (wide area).

Breeding birds were censused in 1997 and 1998 by means of randomly selected point counts in the whole morainic lowland and by means of territory mapping in 1997 in the site (⁵Bibby *et al.*, 1992). The presence of carnivores was detected by means of transects (⁶Cavallini, 1994) both in the area and the site. Bats were censused by means of an ultra-sound device (⁷Violani and Zava, 1992) in Bosco delle Querce on September 1998 and these data were compared to those collected for other

purposes in two Regional Parks comprised in the lowland (Parco Regionale Agricolo-forestale di Montevicchia e della Valle del Curone and Parco Agricolo Sud Milano).

To assess landscape patterns we divided the whole area in cells of 1 km² according to the basal grid of the Regional Thematic Maps (scale 1:50.000) and for each cell we evaluated the percentage of each habitat type present on the maps. We considered 55 habitat types assembled in six main categories: urban areas, farmland, woodland, brushland, roads and railroads, lakes and rivers. Data were linked to a Geographical Information System. On this basis we were able to create and analyse several thematic grids.

To point out the connectivity pattern of the site, the habitat data were used evaluating the landscape composition in five distance belts (0-1 km, 1-2 km, 2-3 km, 3-4 km, 4-5 km). The same evaluation was performed for the lowland cells where highly sensitive bird species (as found by ⁸Fornasari *et al.*, 1999), were found.

Result and Discussion

During the breeding season 1997 and 1998 we performed in the whole lowland area 150 and 258 point counts respectively, detecting 72 and 87 species and 4446 and 9837 birds. Territory mapping in the site highlighted the presence of 31 species, listed in table 1.

As shown by ⁸Fornasari *et al.* (1999) highly sensitive species in this area are mostly those related to forest habitats (with the exception of Redstart *Phoenicurus phoenicurus* that appears as an edge species), while medium sensitive species are usually related to natural or semi-natural open habitats. Within the site we only found the Redstart, plus three medium sensitive species (Red-backed Shrike *Lanius collurio*, Whitethroat *Sylvia communis* and Wryneck *Jynx torquilla*).

The only carnivore species detected in the site was the Red Fox (*Vulpes vulpes*), while in the wide area four species were found (Red Fox, Stone Marten *Martes foina*, Weasel *Mustela nivalis*, and Badger *Meles meles*) The Red Fox is the commonest carnivore species found in agricultural and urbanised areas; its presence is not solely related to good quality habitats and it is not affected by anthropogenic barriers (⁹Fornasari *et al.*, 1998). As found by Fornasari *et al.* the best indicator species for good quality, wide and well connected woods is the Badger. The presence of Stone Marten is related to the edges within the cultivated land, while the presence of the Weasel depends on good quality woods, independently from their size.

Bat species found in Bosco delle Querce are Kuhl's Pipistrelle *Pipistrellus kuhli*, Common Pipistrelle *P. pipistrellus*, Nathusius's Pipistrelle *P. nathusii* and Grey Long-eared Bat *Plecotus austriacus*. According to ¹⁰Fornasari *et al.* (1999) in the whole morainic lowland 12 bat species were found. *P. kuhli* and *P. pipistrellus* are the most common species in Europe and in Italy their presence is usually linked respectively to urban or rural habitats. *P. austriacus* is a well distributed species in southern Europe and its presence is mainly linked to vegetation remnants such as small woods, tree lines and edges. *P. nathusii* is usually found in woods and is known as one of the most important European migratory species. Its presence in September indicates that Bosco delle Querce may play an important role as feeding ground for this species during the migratory season.

The vertebrate fauna composition in the site seems biased towards open habitat or edge species. In fact the surrounding habitat composition clearly points out a low landscape connectivity (tab. 2), as Bosco delle Querce is mainly surrounded by urban areas while sensitive species require at least landscapes dominated by agricultural and wooded habitats. Some woodland related species, such as Siskin *Carduelis spinus* and Chiffchaff *Phylloscopus collybita* or the Nathusius's Pipistrelle

were found here during spring or autumn migration. This fact points out the relevant role of Bosco delle Querce as stepping stone for migrating forest species within a highly modified landscape. The main reasons for the scarce presence of sensitive species or indicator species for good quality wooded habitats are probably:

1. The site is too small to include a higher number of sensitive forest interior species.
2. The site is isolated from other wood fragments more by urban rather than agricultural areas (as shown by tab.2).
3. Woodlots in the site are still young and poorly structured. Ground cover is mainly constituted by grass.

On the other hand the presence of medium sensitive species highlights the importance of the site for the conservation of open habitat species. In fact they find here a suitable breeding site due to the presence of a poorly developed arboreal coverage and of wide undisturbed meadows. Landscape around the site is almost not permeable to the movement of forest interior species, while it does not prevent open habitat species from reaching the site. The presence of Grey Long-eared Bat points out that Bosco delle Querce is an element of habitat diversification required by many species in order to survive in modified landscapes.

Habitat restoration, as in this case, could have an undeniable role in the creation of ecological network constituted by protected areas, wildlife corridors and stepping stones. On the other hand, if forest species are desired, landscape connectivity might be still improved with time and active management.

Acknowledgements

We are grateful to Fondazione Lombardia per l'Ambiente for supporting us in this research through a fellowship given to Elisabetta de Carli.

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Tab.1 Bird species censused both in the site and the wide area.

Species	Bosco delle Querce N° of individuals	Wide area abundance (ind/10 point counts)	Habitat	Sensitivity
<i>Phasianus colchicus</i>	3	0.9	Open	
<i>Columba livia</i>	Not censused	28.0	Anthropogenic	
<i>Columba palumbus</i>	12	2.5	Edge	
<i>Streptotelia decaocto</i>	4	2.3	Open	
<i>Streptotelia turtur</i>	5	2.3	Edge	
<i>Apus apus</i>	Not censused	24.4	Anthropogenic	
<i>Jynx torquilla</i>	3	0.5	Edge	
<i>Hirundo rustica</i>	Not censused	26.1	Anthropogenic	
<i>Delichon urbica</i>	Not censused	7.9	Anthropogenic	
<i>Motacilla cinerea</i>	6	0.1	Open	
<i>Motacilla alba</i>	29	1.5	Open	
<i>Troglodytes troglodytes</i>	1	2.9	Edge	
<i>Luscinia megarhynchos</i>	6	6.5	Edge	Medium
<i>Phoenicurus phoenicurus</i>	1	0.9	Edge	High
<i>Turdus merula</i>	80	25.4	Edge	
<i>Sylvia communis</i>	4	0.1	Open	Medium
<i>Sylvia atricapilla</i>	43	16.5	Edge	
<i>Phylloscopus collybita</i>	4	1.3	Forest	
<i>Muscicapa striata</i>	17	1.5	Edge	
<i>Aegithalos caudatus</i>	71	2.8	Edge	
<i>Parus major</i>	41	8.5	Edge	
<i>Lanius collurio</i>	4	0.7	Open	Medium
<i>Corvus corone cornix</i>	Not censused	20.7	Anthropogenic	
<i>Sturnus vulgaris</i>	Not censused	46.0	Anthropogenic	
<i>Passer domesticus italiae</i>	Not censused	129.4	Anthropogenic	
<i>Passer montanus</i>	Not censused	21.5	Anthropogenic	
<i>Fringilla coelebs</i>	42	17.0	Edge	
<i>Serinus serinus</i>	20	5.7	Edge	
<i>Carduelis chloris</i>	48	8.4	Edge	
<i>Carduelis carduelis</i>	14	6.2	Edge	
<i>Carduelis spinus</i>	1	0.0	Forest	

Tab.2 Percentage of urban areas, agricultural land and woods in five distance belts from Bosco delle Querce and from point in the morainic lowland where sensitive species were found.

Distance belts	BOSCO DELLE QUERCE			SENSITIVE SPECIES		
	Urban areas (%)	Agricultural land (%)	Woods (%)	Urban areas (%)	Agricultural land (%)	Woods (%)
0-1 km	65.0	32.5	1.4	21.1	47.6	24.3
1-2 km	52.0	42.0	3.1	27.0	51.7	16.5
2-3 km	46.2	37.2	8.3	33.3	50.5	13.0
3-4 km	41.4	46.0	11.4	35.7	49.5	11.7
4-5 km	39.7	43.2	11.6	33.2	50.2	10.7