ELSEVIER

Landscape and Urban Planning 44 (1999) 1–11

LANDSCAPE
AND
URBAN PLANNING

Development of a simple method for site survey and assessment in urban areas

Claire Freeman[1]

Resource and Environmental Planning, Massey University, P. Bag 11222, Palmerston North, New Zealand

Received 26 January 1998; received in revised form 29 June 1998; accepted 6 November 1998

Abstract

Planners are coming under increasing pressure to conserve and enhance the natural environment and protect it from development where appropriate. In urban areas informal open spaces are particularly vulnerable to the effects of development proposals. Ecological data on these informal spaces are conspicuously absent. This means that planners often have to make decisions on whether to approve development of sites which are based on limited or no ecological information. Research was undertaken in which a site survey and evaluation method was developed to provide planners with the information necessary to evaluate the ecological value of sites proposed for development. The methodology developed comprised two parts; a site survey and a site evaluation method, in which numerical values were given to the sites' ecological, amenity and development value. The methodology was developed and tested on 30 sites in Leeds, UK, all of which have naturally regenerating habitat and were scheduled for development. A site record, evaluation matrix and set of associated values was developed for each site. These values were then used to identify and compare sites. Three types of sites were identified: sites with significant ecological value that need to be protected from development, sites on which development could be accommodated, and sites where a compromise between development and conservation could be achieved. The results from the Leeds study suggest that it is possible to develop a simple methodology for planners' use to identify and compare the ecological and amenity value of sites proposed for development.

Keywords: Habitat evaluation; Conservation; Urban planning

1. Introduction: planning and the pressure for development

The problem of ''how to maintain economic growth without making excessive demand on natural resources'' is one which has long concerned the planning profession, but one given extra significance within the context of rising environmental concern. This paper examines this problem within the context of developing a practical tool to enable planners to take into account the ecological conservation value of sites proposed for development.

Government policy has undoubtedly added to the conservation dilemma for planners. The market-oriented economic philosophy of the 1980s, and the 1990s has been influential in the de-regulatory thrust

[1]Tel.: +64-6-350-4343; fax: +64-6-350-5689; e-mail: c.freeman@massey.ac.nz

0169-2046/99/$19.00
PII S0169-2046(98)00114-5

of reductions in UK planning powers, a thrust that attempted to return more decision making to the unfettered rigours of market economics. This focus on economic value has impacted substantially on urban open space, particularly informal greenspace whose retention and value has to be justified within a public policy context which is increasingly economic in orientation. The growing focus of development on informal greenspace has been prompted by a combination of city centre de-industrialisation, falling land prices (in some areas), expanding commercial and residential pressures, continuing greenbelt restrictions, and private sector-oriented redevelopment grants. As a consequence, ''in many urban areas land that had been vacant, often for decades, was suddenly targeted for development. It was almost as if there was pressure to eradicate all 'waiting' space in towns'' (Worpole, 1992, p. 27). Much of this 'waiting' space contains vibrant natural habitat, which can be ecologically significant in the urban context. This development pressure highlights the need to identify not only the location of significant urban habitat but also to establish some way of valuing ecosystems and recognising those with the highest conservation values, so that scarce conservation resources can be targeted more effectively.

To target scarce conservation resources planners need access to a methodology that can assist them in establishing the comparative values of urban habitats so that more informed decision making can be achieved. However, both in principle and in practice, the development of any method of evaluation can be both methodologically complex and controversial. This is especially the case where decisions are taken which can influence the protection and conservation of specific sites.

Within this context of decision making in conservation, research was undertaken in Leeds, a large metropolitan area in northern England with a population exceeding 700 000. In Leeds, the development pressures facing urban greenspace are very real and escalating in scale, as is the case in most UK cities. The aim was to develop a site evaluation methodology for planners to use which would provide sufficient information to enable them to make rational decisions on the future of naturally regenerating sites proposed for development.

2. Site survey and evaluation: the need for a more flexible approach

In developing a site evaluation methodology the first area to focus on is the survey, the process through which basic site data are obtained. The process of undertaking site surveys for conservation purposes has traditionally been the preserve of botanists, biologists and other natural scientists, where the assessment of value for wildlife is commonly defined as 'the process of determining ecological value of a site on the basis of predetermined ecological criteria' (see Table 1). The method most frequently used in site surveys in the UK is the site evaluation method developed by English Nature's predecessor the Nature Conservancy Council (JNCC, 1993). It was initially developed to identify key conservation sites, that is National nature reserves and sites of special scientific interest. Criteria for selecting these reserves and sites incorporated those established by Ratcliffe (1977). This method has been adopted by a wide range of nature conservation organisations, including the Ecological Advisory Service which used it in identifying and surveying ecological sites in Leeds.

Other survey and evaluation methods have been developed, mostly in the 1970s and early 1980s (Tubbs and Blackwood, 1971; Pickering, 1977; Goodfellow and Peterken, 1981; Kent and Smart, 1981). These methods tending to focus on rural or relic habitats, require significant levels of ecological expertise and were never developed beyond the initial survey area. In their review of site evaluation methods, Usher (1986) and more recently Spellerberg (1992) both focus on the scientific, biologically determined approach to evaluation as it pertains to rural habits characterised by rare, fragile and unspoilt habitats.

In respect of urban habitats the application of purely ecological survey criteria has been challenged as being too narrow and, therefore, inappropriate. The need for a reappraisal of traditional evaluation techniques with respect to urban habitats is one that has been addressed by Gilbert in his analysis of the *Ecology of Urban Habitats:*

> (there is) an unresolved dilemma concerning the evaluation of ecological sites in towns. Should the traditional biological criteria used for rural areas (Ratcliffe, 1977), which put a high value on

Table 1
Requirements for an alternative urban evaluation methodology

Criteria traditionally used in site surveys for assessing value (after Ratcliffe, 1977)	Limitations in the application of traditional survey and evaluation methods to urban sites	Characteristics of urban sites	Alternative criteria that could be used in assessing value of urban sites
Size; the bigger the better	Tendency to focus on pockets of relic/rural landscapes	Presence of urban species which are highly mobile opportunists	Dynamism (as indicated by the ability of the vegetation and wildlife to respond to change)
Unfragmented	Tendency to focus on slivers of countryside at the edge of town	Species and habitat types that are often viewed as 'unsightly' and 'undesirable'	Robustness (ability to withstand human pressure)
Typicalness (habitat should have experienced a minimum of modification)	Traditional ecological criteria such as rarity, naturalness etc. can have limited applicability in urban areas	Appears unkempt and may contain large amounts of dead plant material	Location (e.g. proximity to a school or residential home, and location in area of natural deprivation)
Rarity (presence of rare or endangered species)	No recognition is given to the value of urban species e.g. goats rue	Includes a number of 'alien species', some of may be regarded as 'pest species' (e.g. grey squirrel)	Amenity and use value
Diversity (number of species often used as indicator)	Areas of habitat that are robust and well suited to urban conditions may score low values	Temporary duration	Urban species
Fragility (sensitivity to change and use)	No recognition is given to educational, leisure and other values	A diverse range of habitat types	Variety ('typicalness' is generally an alien concept as all sites are significantly different)
Age	Value of the site is not fixed but can vary according to location, e.g. inner city site may be more valuable than similar site on periphery	Historical links may be evident in the habitat and species type e.g. shoddy plants in Yorkshire woollen mill areas	Special features (these could include footpaths, walls and hedgerows, a large duck population)
Ecological position(in relationship to habitat)	Many sites are young and would score low on maturity criteria	Debris, including garden debris and garden plants which may establish	Rarity that is with regard to the location and number of comparable sites.
Recorded history	It may be necessary to look at the site's potential in addition to its current character	Diverse landscapes including walls, buildings, and other human remnants	
Naturalness		Robust habitats demanding low maintenance and able to stand up to frequent use and abuse	
Intrinsic appeal		Local character and local species	

> rarity, non-recreatability, richness, diversity, and historical continuity, be employed or is it more appropriate to give prominence to social factors like ease of access, aesthetic appeal, proximity to town centre, ability to withstand disturbance and occurrence in areas of local deficiency (Gilbert, 1989, p. 4).

Developments in habitat evaluation or biotope mapping in Germany in the 1980s, did take into account the modified nature of urban habitats and did recognise the interface between people and habitats (Wittig and Schreiber, 1983; Sukopp and Weiler, 1988). The focus was still very much on biological assessment and in the case of Sukopp and Weiler required the use of trained ecologists. In UK, Carr and Lane (1993) have developed a method which includes urban amenity and ecological criteria. The method was designed to be carried out by community groups with an interest in local sites and is based on English Nature's Phase I survey technique (JNCC, 1993).

In the growing prominence of market economics in recent years, evaluation has attracted the interest of a more diverse range of professionals in conservation evaluation. These include economists (notably, Winpenny, 1991; Pearce and Moran, 1994), whose focus has been with the application of economic values to conservation elements. Costanza et al. (1997) argue that such applications are essential:

> The issue of valuation is inseparable from choices and decisions we have to make about ecological systems . . . Some argue that the valuation of ecosystems is either impossible or unwise . . . so although ecosystem valuation is certainly difficult . . . one choice we do not have is whether or not to do it . . . Rather, the decisions we make as society about ecosystems imply valuations (Costanza et al., 1997, p. 255).

Costanza et al. (1997) focused on the application of monetary values to global ecosystem components, but their assessment of the principles of and need for valuation also apply to small-scale ecosystem valuation and decision making. It is an argument that Jarvis (1996) develops with regard to urban greenspace in the UK:

> Land is a scarce resource for which there is much competition. Land for nature conservation or amenity has to compete, in urban areas with housing, industry, commerce, institutional use and transport routes . . . It is inevitable some sort of evaluation be made, or some sort of quantification be devised, in order to inform decisions about which sites to fight hardest for when planners sit in judgment (Jarvis, 1996, p. 92)

In developing the Leeds method it was necessary to adopt a broad approach which takes into account not only the ecological but also the amenity and development values of urban sites. The method needed to incorporate an evaluative element which would give planners a rational basis on which to decide the future of these multiple value urban sites. Development of the methodology necessitated amalgamating knowledge and techniques from a number of fields, namely ecology, planning and geography (geographic information systems). The methodology developed comprised two parts, a site survey and a site evaluation.

3. Site selection

Thirty sites, all with naturally regenerating habitat and all subject to development proposals were identified. These provided the basis on which the methodology was developed and tested (Table 2). Site identification was in itself a complex undertaking as there was no central repository of information on open space and much of the open space data was dated (e.g. many sites registered as open space had already been developed). Sites were identified through the City Council's open space survey, the Unitary Development Plan, Nature Conservation Strategy (Leeds City Council, 1992), Phase I survey data, newspaper reports and through on the ground exploration of open space. The process of site identification clearly revealed the need for a comprehensive, regularly updated inventory of urban open space.

4. The site survey

The aim of the research was to provide a 'rapid response' survey to use on sites where there are no or very limited ecological data available and where there are constraints such as limited access to ecologists to undertake ecological surveys. The intention was not to replace full ecological surveys. The survey would,

Table 2
Summary of key habitat and development characteristics of surveyed sites

Habitat type	Number of sites	Proposed development	Number of sites
Grassland	23	Housing	19
Mature trees	17	Long term development	2
Scrub	11	Economy	8
Wetland	9	Highways	3
Ruderal[a]/wasteland	8	Marina	1
Woodland	7	Light rapid transit	1
Hedgerows	7	Park and ride	1
Derelict land/hard-core	3		
Playing fields	3		
Allotments	3		
Quarry	2		
Farmland-arable	2		
Cemetery	1		

[a]'Ruderal' refers to vegetation characteristic of the first stages of vegetation succession.
Note: Sites can have more than one main habitat type and more than one type of development proposal.

however, be useful in identifying and targeting sites requiring a detailed ecological survey. In devising the Leeds survey methodology it became clear that no one existing site survey method could be adopted in whole or even to any substantial degree to meet the needs of the Leeds research. The survey was designed to be compatible, as far as possible with standard ecological surveys (particularly that used by English Nature) to facilitate transfer of information and to build on survey formats that have been successfully tried and tested elsewhere. The survey provides for the recording of ecological amenity and development attributes and a simple site map (extracts from a completed site survey is included in Table 3).

4.1. Ecological attributes

The survey includes criteria familiar to most ecological surveys, rarity, age, habitat structure and diversity (see Table 1, column 1). In constructing the survey, criteria used in traditional site surveys were considered, as were the characteristics of urban sites which would need to be included in the survey and evaluation (see Table 1). Criteria were selected which could be easily identified, and recorded and which were indicative of the prime conservation, amenity, and development values of the site. They also had to be readily identifiable to non-specialists. Included in the survey were criteria which reflected the specifically urban ecological character, such as the 'contribution of urban species', and the location of other local green space.

4.2. Amenity attributes

Reference to amenity use, is not normally be included in standard 'ecological' site surveys. The Leeds survey includes direct 'observation of users' (e.g. dog walkers) and indirect indicators of use (e.g. the presence of paths). Both of these elements were included in surveys of public use of urban green space carried out by Millward and Mostyn (1989) on conservation sites and Comedia in association with DEMOS (1995) on parks.

4.3. Development attributes

These include data on the site's development potential as indicated by planning applications, zonation in development plans and development related activities on the site.

4.4. Site map

The survey includes a simple sketch map showing key habitat-types and features. The map together with survey and evaluation data was transferred onto a GIS to produce a site database. A full discussion of the GIS however, lies outside the scope of this paper.

Table 3
Extracts from site survey for Pontefract Road; a middle ranking site

Site evaluation: checklist	
A. General	
Site name	Pontefract Road corner
Weather	Sunny
Site reference number	10
Site location	Opposite Waddingtons Factory Hunslet
Site designation	None
Age	
0–4 years	
5–10 years	
11–20 years	X
20+ years	
Size	0.6 ha
Neighbouring uses	Industrial
Local green space location and closest sites and approximate distance	Close to Stourton Marsh and Lower Aire valley approximately 1 km as the crow flies, no formally designated public open space close by
Main land use of site	Wasteland; cleared housing, cleared in the 1970s to make way for road improvements
B. Habitat and species summary	
Site description	Diverse wasteland site, well developed with good mix of urban species/ garden escapes and garden plants left when houses demolished, and also range of native plants. Mature trees to the back of the site, with fairly dense stands along the rear. Line of trees also along the access to adjacent factory off Pontefract road. Reed canary grass grows along the Waddingtons factory side
Diversity	
Vegetated banks	
Ground layer	X
Open water	
Low grassland/herb layer	X
Running water	
Tall herb/grassland	X
Marsh/swamp	
Low shrub/scrub layer	X
Hedge	
Scrub layer – well developed	X in parts
Verges	
Woodland walls/buildings	X (remnants)
Mature trees	X
Rubble	X
Dead wood	
Other	X (mown grass)
Contribution of urban species	Buddleia (orange golf ball type), Lime tree, Laburnam, Garden Rose, Japanese knotweed
Notable ecological features/species	Excellent diversity for such a small type, though none of it contains any rare or unusual species or habitat type. Diversity possibly due to its historical function as housing and as the site of a church
Recommend further ecological survey	Yes
C. Amenity value	
Access to site	Pontefract Road and Wakefield Road
Site locality description	Mainly industrial, close to residential estates in Hunslet. Bounded on two sides by major roads
Site use	None, minimal through routing
Informal recreation eg.walking	
Dog walking	
Ball games	
Allotments	
Children e.g. dens, fishing	
Other	

Table 3 (continued)

Site evaluation: checklist	
Paths	
No paths	
Indistinct grassy paths	X
Not well used	
Surfaced paths	
Paths overgrown	
Clearly defined paths	
Well used	
Well developed path network over site	
Facilities	None
Benches	
Picnic areas	
Car parking	
Signs/information	
Playing fields	
Litter bins	
Other	
Potential value	Visual amenity due to location at junction intersection, possible development as pocket park
Site management/development	Currently neglected with no management, some dumping of tyres
D. Site development	
Development proposals/designation in statutory plan	Highway development
Planning applications	None recently, factory development application, undated
Percentage of site to be lost to development	Highway developments take strip along both roads; factory proposals take whole site
Observed threats to site	Earth mounds and JCBs along Pontefract road but seem to be related to footpath expansion
Possible alternative development sites	None for road expansion, several for factory development
Notable site features (i.e. features possibly needing specific protection)	Line of mature trees alongside factory access off Pontefract Road, mature trees to rear of site
Data sources	None

4.5. Site survey as applied to a medium ranking site: Pontefract Road

Pontefract Road is a site that is unlikely to be surveyed in a standard ecological survey. Its small size 0.6 ha means that it falls outside the minimum 2 ha usually required for ecological surveys. A triangular shaped corner site adjoining two major routes into Leeds, the site was cleared of housing in the 1970s to make way for a road gyratory. The gyratory was never built and the site developed its own distinctive urban ecology. The site survey (see the completed example in Table 3) identified several positive features, namely significant diversity given its small size, mature trees, developing scrub/woodland and an interesting combination of garden and native flora. Though the site had minimal current amenity value other than visual amenity, it has substantial potential for being developed as a pocket park. Development of the site is inevitable as the edges of the site are to be taken for road widening schemes already approved.

5. Site evaluation

A site evaluation based on the site survey was then constructed. Quantitative values were assigned based on ecological, amenity and development criteria. The need to evaluate sites in urban areas especially when dealing with a scarce resource such as natural open space or development land is becoming inescapable. Planners can use these values to compare the relative ecological and amenity merits

Table 4
Application of the site evaluation[a] matrix to a high ranking site

Name of site			Hawthorn Farm			
Current use			Grassland and scrub			
Location			Off Coal Road Seacroft			
Neighbouring uses			Residential and industrial			
Ecological value	Age	Structure	Habitat	Size of site	Ecosystem	Rarity comparable sites
/30[b]	/5	/5	/5	/5	/5	/5
26	5	4	5	5	2	5
Amenity value	Use	Facilities	Access	Added value/ intrinsic appeal	Potential	Scarcity comparable sites
/30[b]	/5	/5	/5	/5	/5	/5
20[c]	3	2	3	4	4	4
Use value sub total 46/60						
Development value	Zonation	Planning applications	% site loss	Damage on site	Environ-mental impact	Alternative development sites
/30[b]	/5	/5	/5	/5	/5	/5
21[c]	4	4	4	2	5	2
Target note	Site of high ecological value. Mature hedgerows. Great crested newts. Active local campaign group, Hawthorn Farm Action Group, opposing development of site as proposed by Leeds Development Agency, on behalf of the site owners Leeds City Council					

[a]Number followed by / indicates values assigned to each parameter.
[b]Total value.
[c]Total evaluated.

of sites facing development so that efforts can be focused on conserving those sites whose ecology is deemed most valuable or threatened. As with the site survey there was no one methodology available that proved to be directly transferable. The method selected for use was construction of an evaluation matrix.

The matrix developed includes three sections representing, ecological, amenity and development value (Table 4). Each section comprised six criteria which were ascribed values on a 5-point scale. The choice of a 0–5 rating (following Wittig and Schreiber, 1983) was used as a compromise between the need to keep the values as simple as possible (Carr and Lane recommend a 1–3 rating) and the need to represent a range of conditions.

One difficult issue that had to be addressed in the site evaluation was, should all criteria have the same maximum potential score of 5? Is rarity, for example, of equal importance to size in establishing ecological value? To try and incorporate these concerns by issuing different maximum values would introduce significant complexity into the evaluation process and make it difficult to produce simple total figures for the three key values of ecology, amenity and development. It was decided, therefore, that all criteria would have equal weighting and maximum values and if necessary revisions would be undertaken following testing of the evaluation matrix on the 30 sites. To address potential difficulties in ascribing scores to criteria an extensive site scoring guide was produced, designed to be used in conjunction with the site evaluation matrix.

5.1. Site evaluation as applied to a high ranking site: Hawthorn Farm

Table 4 shows the site evaluation matrix as applied to Hawthorn Farm, a high ranking ecological site. Hawthorn Farm comprises relic farmland encapsulated within expanded suburban development. It has been the focus of substantial public attention since the

city council's development agency decided to sell the site for development. A campaign to save the site was initiated by local residents assisted by environmentalists and caused the city council to reconsider the decision to sell the land. The future of the site is still uncertain. The evaluation matrix when applied, gives the site a high ecological score, as it comprises uncommon well-developed habitats, particularly hedgerow habitat, and is home to the rare and protected great crested newt (*Triturus cristatus*). An independent ecological survey of the site commissioned by the city council subsequently confirmed the site's high ecological value. The site also has a relatively high amenity score, primarily accountable to its location and use by the adjacent primary school and its heavy use for local recreation. The high development value indicates that the site is extremely vulnerable to development.

6. Discussion

Results from all the sites were collated and a composite summary table created showing comparative amenity, ecological and development values for all the sites (Table 5). Sites could score a maximum 30 for each category. Examination of the three key values provides a quick indication not only of the site's ecological and amenity value, but also of the development threat to the site. Detailed information for the sites can be obtained by reference to the site's survey record, the evaluation matrix and the site map.

One of the difficulties associated with the process of ascribing values is identifying what value is consistent with a site being regarded as 'valuable' or significant. Where quantitative values are ascribed thresholds have to be established to give meaning to the values. These thresholds will inevitably be the focus of much debate. When threshold values are established these should always be used for guidance only, with particular attention given to sites with values close to thresholds (see the case of Pontefract Road, Table 5). In the Leeds research thresholds were established at 14 and 20, the following indicative threshold values were proposed for assessing ecological value:

0–14 Limited ecological value: could feasibly be developed.

15–20 Some ecological value: could be developed but may have elements of the site which should be conserved.

21–30 Ecologically valuable site which should be conserved, sites with values in excess of 25 being extremely valuable in the urban context.

In the final analysis the benefit of the methodology depends on its ability to identify the value of the site and/or its vulnerability to development. In this regard the method facilitates the identification of three key site-types.

1. *Sites with significant ecological and/or amenity value that need to be protected from development*: Sites which obtained high ecological values using the Leeds method were the same sites as those recognised by the Leeds Nature Conservation

Table 5
Extract from the site values data table showing values for 10 of the sites

Site name	Ecological value/30	Amenity value/30	Total use value/60	Development value/30
Stourton Marsh	27	12	39	27
Hawthorn Farm	26	20	46	21
Kirkstall Canal	23	22	45	26
Beckett St. Cemetery	23	26	49	7
The Oaklands	22	11	33	26
Osmondthorp Sidings	20	19	39	16
Pottery Lane Station	15	8	23	23
Pontefract Road	14	7	21	17
Gledhow Park Road	12	11	23	22
S. Accomodation/Easy Road	7	5	12	20

Office and the Ecological Advisory Service as warranting a protective nature conservation designation. These sites were; Stourton Marsh, Hawthorn Farm, Kirkstall Canal and Osmondthorp Sidings, The Leeds method also effectively identified sites with substantial amenity value. Four of the five sites with highest amenity values were the focus of local support groups which were active in opposing the development proposals. Sites that are of greatest concern as indicated by their site values, are those with a high use value comprising a high ecological and/or amenity value and high development values. The sites that were identified as most urgently in need of conservation were: Stourton Marsh (developed July 1996); Kirkstall Canal (developed mid-1995); the Oaklands (developed mid-1995 onwards) and Hawthorn Farm (future still uncertain).

2. *Sites of low ecological on which development could be accommodated*: these are sites with low ecological value whose protection cannot be supported. Examples of such sites included the South Accommodation road sites and Wortley Junction, all had been developed by mid-July 1996.
3. *Sites where a compromise between development and conservation could be achieved*: such an approach necessitates either identifying and protecting those parts of the site with highest ecological and amenity value or undertaking development which can be compatible with the site's existing value. One example of where a compromise is possible is that of Pontefract Road proposed for development as part of a road widening scheme. The ecological value of the site margins (mainly mown grass, derelict hardcore and rubble), where the road widening is to occur, is low. The remainder of the site where the ecological value is higher (mixed scrub with mature trees) could be retained and enhanced by natural landscaping which builds on the existing habitat.

7. Conclusions

The success of the Leeds methodology will depend on the extent to which it can be replicated and made applicable to land-use planning in a range of contexts. These might include, for example, local authority planning and leisure services departments, community groups, specific interest groups, and utilities such as water companies.

The strength of the Leeds methodology lies in its simplicity and its flexibility. Though designed for and tested on sites in Leeds, its simple structure and the range of criteria it includes means that it should be general enough to be applied to a range of situations, and organisations. Flexibility is also evident in the way the survey and evaluation matrix can be amended to incorporate additional or alternative criteria as necessary, or to include additional data such as species lists or planning decision notices.

A central concern in devising the methodology was to develop a means of quantifying the relative amenity, development and ecological merits of sites. Again, the site evaluation matrix and the scoring guide were kept simple. The scoring guide and consequently criteria scores can be amended to reflect local circumstances. The site evaluation matrix also adopted elements of standard ecological recording techniques, most notably the target note technique which allows for the identification of significant features. The value and applicability of the evaluation method has considerable potential for further development when used in conjunction with a geographic information system (GIS). GIS could facilitate the adjustment of criteria and values (by adjusting weightings) to reflect differing ecological, developmental and geographical circumstances. It broadens the range of potential users by facilitating data transfer and thus, supporting the type of interdisciplinary work now being increasingly undertaken in the field of biodiversity conservation and sustainable development.

The Leeds methodology is only the first step in what should become a more detailed and comprehensive process of land-use planning, biodiversity conservation and decision making research. It demonstrates how an interdisciplinary methodology for the evaluation of sites with multiple values can contribute to the land-use planning process. The methodology was developed through the analysis of 30 naturally regenerating sites in Leeds. To evaluate the wider validity of the Leeds methodology it needs to be evaluated with regard to its replicability and applicability to a much more extensive range of planning circumstances. This could be achieved by undertaking a comprehensive

evaluation of all the naturally regenerating land in an urban area, rather than applying the evaluation just to selected sites. Further research could focus on the evaluation and application of the methodology to the full range of biological contexts, not just to naturally regenerating land.

Biodiversity conservation is a major concern for planners, and conflicts between development and conservation will remain a central planning issue. Methodologies such as the Leeds one can make a positive contribution to natural land-use planning in urban areas. However, the methodology is only a tool. Its success depends on its being used by planners, supported by ecologists and others with expertise in land-use management who are able to interpret and apply the methodology in an informed and ecologically aware way. The development of practical planning conservation tools is essential if the loss of sites such as Stourton, with its orchids and cuckoos to developers is to be avoided in the future.

Acknowledgements

I would like to offer sincere thanks to Dr. Andy Millard of Leeds Metropolitan University for sharing with me his considerable ecological expertise, for his generous assistance in devising the methodology, and for his advice on revising this paper.

References

Carr, S., Lane, A., 1993. Practical Conservation of Urban Habitats. Hodder and Stoughton, London.

Comedia in association with DEMOS, 1995. Park Life Urban Parks and Social Renewal. Comedia, Stroud, Gloucester.

Costanza, R., DArge, R. De Groot, R. et al., 1997. The value of the world's ecosystem services and natural capital. Nature 387, 253–260.

Gilbert, O., 1989. The Ecology of Urban Habitats. Chapman & Hall, London.

Goodfellow, S., Peterken, G.F., 1981. A method of survey and assessment of woodlands for nature conservation using maps and species lists. Biol. Conser. 21, 177–195.

Jarvis, P., 1996. Planning for a green environment in Birmingham, In: Gerrard, A.J., Slater, T.R. (Eds.). Managing a Conurbation: Birmingham and Its Region. Brewin Books, Studley.

Joint Nature Conservation Committee, 1993. Handbook for Phase I Habitat Surveys. JNCC, Peterborough.

Kent, M., Smart, N., 1981. A method for assessment in agricultural landscapes. Appl. Geog. 1, 9–30.

Leeds City Council, 1992. Nature Conservation Strategy. Leeds City Council, Leeds.

Millward, A., Mostyn, B., 1989. People and Nature in Cities. Nature Conservancy Council, Peterborough.

Pearce, D., Moran, D., 1994. The Economic Value of Biodiversity. Earthscan, London.

Pickering, M.E., 1977. Can Pickering's Principle help put a price on a poplar? New Civil Engineer, 22–23 May.

Ratcliffe, D.A., 1977. A Nature Conservation Review, vols. 1. and 2. Cambridge University Press, Cambridge.

Spellerberg, I.F., 1992. Evaluation and Assessment for Conservation: Ecological Guidelines for Determining Priorities For Nature Conservation. Chapman & Hall, London.

Sukopp, H., Weiler, S., 1988. Biotope mapping and nature conservation strategies in urban areas of the Federal Republic of Germany. Landscape and Urban Planning 15, 39–58.

Tubbs, C.R., Blackwood, J.W., 1971. Ecological evaluation of land for planning purposes. Biol. Conser. 3(3), 169–172.

Usher, M.B., 1986. Wildlife Conservation Evaluation. Chapman & Hall, Cambridge.

Winpenny, J.T., 1991. Values for the Environment A Guide to Economic Appraisal. HMSO, London.

Warpole, K., 1992. Towns for people: transforming urban life. Oxford University Press, Buckingham.

Wittig, R., Schreiber, K.F., 1983. A quick method for assessing the importance of open spaces in towns for urban nature conservation. Biol. Conser. 26, 57–64.