Biodiversity in the City: Proceedings of a one-day international conference held in Dublin 12th September 2002

Presented by:

Network of Urban Forums for Sustainable Development
Urban Institute Ireland

With support from:

DG Environment
Environmental Institute, UCD
European Foundation for the Improvement of Living and Working Conditions

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Design and lay-out: Andrew Hendrickson

Printing: JF Walsh Printers, Roscrea, Tipperary

ISBN: 190227766X

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Preface

This report comprises the proceedings of an international conference held in Dublin September 12th 2002 on Natura 2000 and Biodiversity in the City. The European Foundation for the Improvement of Living and Working Conditions kindly donated their premises in Loughlinstown as the venue. The conference was hosted by the Urban Institute Ireland and the Network of Urban Forums for Sustainable Development and funded by DG Environment.

The Network of Urban Forums for Sustainable Development comprises local organisations committed to and with long experience of (awareness-raising for) environmental protection. The network is rapidly expanding to cities in Europe and meet several times annually and partake in environmental projects. The annual meeting in 2002 was held in Dublin to coincide with the Natura 2000 and Biodiversity in the City conference.

Some of the services provided by the Urban Forum Network:

- Making urban communities aware of EU measures and programmes with regard to the environment and sustainable development by disseminating information and organising discussions and conferences, etc.

- Providing advice aimed at improving the urban environment, e.g., on the basis of EU programmes and legislation

- Providing access to information about experiences in other European cities

Further information on the network and the Dublin Urban Forum can be found at: http://www.ucd.ie/~envinst/envstud/forum.html

Speakers at the conference included Irish experts in the fields of biodiversity and urban green space issues, as well as members of the Network of Urban Forums with expertise in these areas. The conference was attended by policy makers, consultants, academics, students, NGOs and other interested parties.
Natural and Semi-Natural Habitats in the City

Prof David Jeffrey,
Trinity College,
Dublin

Abstract

The past pattern of urban design has generated a series of distinct habitats ('green space') in cities, which collectively carry a considerable biodiversity. Dublin may be used as an example representing most of western Europe. Habitats range from the shores of Dublin Bay and those quasi-natural habitats in engineered features, canals, motorways & railways, to the heavily managed gardens of suburban houses.

The ecosystems associated with each habitat interact with the harsher features of urban environment, mitigating its effects on the human population, and providing a series of positive externalities, classified as “utilities”, “amenities” and “biodiversity”. It is argued that life in cities would be virtually intolerable without them, and a continuing debate must attempt to decide appropriate balance between green space protection, and development. Because of the positive economic value of green space, a bargain must be struck between the demands of developers to buy space in the city, and the needs of human inhabitants for all that habitats can provide.

Urban habitats are affected by the urban heat island effect and associated illumination. They clearly mitigate wind speed, noise and dust. They have positive effects on hydrology, tidal surge protection and flood control. Coastal ecosystems are known to refine engineered sewage treatment systems. They permit the monitoring of environment through bioindicators. Public amenity values must also be added, which may be quantified in terms of positive gains in terms of health.

Urban habitats also have a meaningful role in the conservation of wildlife, with the capacity of Dublin Bay to accommodate high densities of over wintering wild fowl as an irrefutable example.

New planning movements assert that housing density must increase to contain physical spread of the city. To allow this to happen, the management of green space and nature in the city must intensify and extend beyond mere amenity horticulture. For example the river valleys of the city can be enriched by habitat restoration, as safe amenity areas. Given current levels of comprehension of the system, it is plausible that the city can continue to intensify, but with a serious regard for nature and biodiversity.

Introduction – Kinds of Urban Habitat

The past pattern of urban design has generated a series of distinct habitats in cities, which collectively carry a considerable biodiversity. Dublin may be used as an example representing most of Western Europe. Habitats range from the shores of Dublin Bay and those quasi-natural habitats in engineered features, canals, motorways & railways, to the heavily managed gardens of suburban houses. At least ten kinds of habit may be identified. (Table 1.)

The wide varieties of habitat types imply a considerable reservoir of biodiversity. It is also obvious that the capacity to apply management is strongly limited. Another important idea is that urban land does not have to be accessible to be functional, because of the multiple “uses” that may be attributed to green space.
Table 1: Urban habitat types, examples from the Dublin conurbation and comments on management

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
<th>Notes on management</th>
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</thead>
<tbody>
<tr>
<td>1. Nearly natural habitats</td>
<td>Shores of Dublin Bay; Freshwater rivers &amp; streams and associated valleys; foothills of Dublin Mountains.</td>
<td>People management to achieve balance between conservation, education and amenity. Designation of reserves where appropriate.</td>
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<tr>
<td>2. Quasi-natural habitats associated with engineered features.</td>
<td>Canals; Tidal Liffey; Railways; Roadsides, Airports, Power stations and large industrial areas</td>
<td>Mainly linear features, managed for weed control. Roadsides are deliberately planted for amenity. Concept of wildlife corridors important.</td>
</tr>
<tr>
<td>3. Peri-urban agricultural Land</td>
<td>North &amp; west of Dublin city</td>
<td>Agricultural management, but sometimes abandoned. Rich in ruderal sites and hedgerows</td>
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<tr>
<td>4. Suburban Public Parks &amp; Gardens</td>
<td>St. Annes Park; Marley Park; National Botanic Garden.</td>
<td>Very heavily managed for particular amenity based uses. Often high application rates of agrochemicals, especially herbicides and fertilizers.</td>
</tr>
<tr>
<td>5. Sports grounds</td>
<td>Golf courses; GAA pitches; Rugby, Soccer,</td>
<td>Site size and habitat fragmentation important. Great potential for biodiversity oriented management. Awareness education for middle-rank managers very important.</td>
</tr>
<tr>
<td>6. Urban “Public” open space</td>
<td>Trinity College; St. Stephen’s Green; Merrion Square; Fitzwilliam Square; Mountjoy Square;</td>
<td>Trees heavily pruned, to avoid high vehicles and utility lines on poles. Increasing pressure on underground rooting space caused by services. Low biodiversity, but very high utility &amp; amenity values.</td>
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<tr>
<td>7. “Private” open space</td>
<td>Convents; Schools; Hospitals; Cemeteries; Churchyards;</td>
<td>Variable, but often very low level of management. Very conservative planting, which could be made more wildlife friendly.</td>
</tr>
<tr>
<td>8. Planted streets</td>
<td>Griffith Avenue; Leeson Street, O’Connell Street.</td>
<td>By definition, unmanaged, except for occasional weed control and nuisance abatement (vermin control). Potentially very rich in species.</td>
</tr>
<tr>
<td>9. Derelict land</td>
<td>Dublin Port; former Gas works; former Landfill</td>
<td>Generally highly managed for amenity and crop yield. High application rates of fertilizers, herbicides and pesticides. A very large resource that ecologists and planners should evaluate for amenity, utility and biodiversity values</td>
</tr>
</tbody>
</table>
Utility functions of green space

The ecosystems associated with each habitat interact with the harsher features of the urban environment, mitigating its effects on the human population, and providing a series of positive externalities (Table 2).

Table 2: Features of the urban environment and the utility effects of green space. From several sources including Horbert et. al.(1983), Gilbert (1989) & Anon. (1983)

<p>| | |</p>
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<tbody>
<tr>
<td>a)</td>
<td>Urban heat island effect – minima increased enabling winter growth and survival (Anon. 1983)</td>
</tr>
<tr>
<td>b)</td>
<td>Illumination – daylength extended affecting plant and possibly animal, behaviour.</td>
</tr>
<tr>
<td>c)</td>
<td>Gaseous air pollution-deleterious effects on all organisms.</td>
</tr>
<tr>
<td>d)</td>
<td>Dust*– usefully reduced by all plants, but especially trees</td>
</tr>
<tr>
<td>e)</td>
<td>Windspeed* – substantially reduced by trees</td>
</tr>
<tr>
<td>f)</td>
<td>Evapotranspiration* – x2 increase</td>
</tr>
<tr>
<td>g)</td>
<td>Infiltration* – increased substantially</td>
</tr>
<tr>
<td>h)</td>
<td>Run off* - greatly reduced</td>
</tr>
<tr>
<td>i)</td>
<td>Noise* - effectively reduced by trees</td>
</tr>
<tr>
<td>j)</td>
<td>Sewage assimilation*by coastal ecosystems</td>
</tr>
<tr>
<td>k)</td>
<td>Erosion &amp; tidal surge protection* afforded by shoreline communities.</td>
</tr>
<tr>
<td>l)</td>
<td>Biointicators* of urban environmental quality are offered by many organisms (e.g.Weinert.1991, Richardson 1991, Dowding &amp; Peacock 1991)</td>
</tr>
</tbody>
</table>

* functions of vegetated surfaces

It is argued that life in cities would be less tolerable without these externalities, and a continuing debate must attempt to decide appropriate balance between habitat (green space) protection and physical development. Because of the positive economic value of habitats, a bargain must be struck between the demands of developers to buy space in the city, and the needs of human inhabitants for all that habitats can provide.

Amenity functions

Public amenity values must also be added to the utility functions listed above, which may ultimately be quantified in terms of positive gains in terms of health. (Table 3).

Table 3: Amenity functions of green space

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<tbody>
<tr>
<td>a)</td>
<td>Exercise &amp; informal recreation</td>
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<tr>
<td>b)</td>
<td>Sport</td>
</tr>
<tr>
<td>c)</td>
<td>Aesthetic pleasure</td>
</tr>
<tr>
<td>d)</td>
<td>“Healing” – anxiety reduction (Cooper, Marcus &amp; Barnes, 1999)</td>
</tr>
<tr>
<td>e)</td>
<td>Education</td>
</tr>
<tr>
<td>f)</td>
<td>Personal achievement – gardens &amp; allotments</td>
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</table>

The value of amenity and utility functions above, should engage the attention of environmental economists. The tendency for sports grounds, such as golf courses, to move to the periphery of the city should be questioned. Not only may extra vehicle trips be generated, but that utility and amenity values may be reduced at a large cost to the community.
**Conservation and biodiversity functions**

Urban habitats also have a meaningful role in the conservation of wildlife, with the capacity of Dublin Bay to accommodate high densities of over wintering wild fowl as an irrefutable example (Table 4).

<table>
<thead>
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<th>Table 4: Conservation &amp; Biodiversity functions</th>
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<tbody>
<tr>
<td>a) Range of “natural” habitats - Dublin Bay; Phoenix Park; River valleys</td>
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<tr>
<td>b) New habitats – buildings; derelict land; flowerbeds; lawns</td>
</tr>
<tr>
<td>c) Alien species –Planted species; Garden escapes; “Industrial” aliens associated with cargoes</td>
</tr>
</tbody>
</table>

Whilst a substantial native flora has been recorded for inner Dublin (Wyse Jackson & Sheehy Skeffington, 1984), urban ecologists must face the fact that the substance of the vegetation is largely non-native. This does not mean that its ecology is of no interest. It is technically possible, and rewarding to apply standard measures of biodiversity to urban situations (Grant, 1997). It is also possible to study long-term ecological change in urban gardens (Owen, 1991). Concepts of biodiversity and ecosystem function may be explained to urban green space managers. The dynamics of change in suburban gardens with time should be explored, and their capacity to accommodate semi-natural communities measured. For example the range of tit (Parus sp.) and other resident and migratory bird species in the city and suburbs should be a topic of continual interest. Similarly the range of butterflies and moths and their association with both native and non-native food plants should also be of interest to the public. Education is a key factor, using both formal and informal channels to impart the message “look around you, you are living in a huge resource for biodiversity”. If the quality of biodiversity declines, then a reason should be sought and a remedy implemented. Biodiversity itself is an indicator of environmental quality.

**The future**

New planning movements assert that housing density must increase to contain physical spread of the city. To allow this to happen, the management of nature in the city must intensify and extend beyond amenity horticulture. For example the river valleys of the city can be enriched by careful habitat restoration, as safe and secure amenity areas. There are also opportunities for the creation of green space on inner urban brownfield sites. It is argued above that these are essential components of the infrastructure for urban living and working, and will ultimately define the quality of the redeveloped inner city.

It is also of interest that suggestions for higher density suburban living are aimed at higher densities of people per hectare of land, but with similar plot ratios (McCabe, O’Rourke & Flemming, 1999). These proposals require testing through experiments in habitat creation at neighbourhood level. Monitoring of birds, butterflies, bats and beetles by residents and school children should be a constant feature of urban and suburban life.

Given current levels of comprehension of the system, it is plausible that the city can continue to intensify, but with a serious regard for nature and biodiversity and as an optimum habitat for people.
References


McCabe F., O’Rourke B. & Flemming M. 1999 *Planning issues relating to residential density in urban and suburban locations*. Dublin, Department of the Environment.


Baines


In the beginning - and this beginning is all of 10,000 years ago - the city was conceived of as the place where human capacity would have the space to develop and blossom, to become more human; it was set over against the wilderness out of which hunting and gathering man had grown, which had moulded and nourished him - in evolutionary and genetic terms for 99% of human time, but only through the life of cities could the peculiarly precious human dimension develop properly. So it is no etymological accident that the city in Latin is *civis*, the root of civilisation; and *polis* in Greek, the root of polity and policy and politic, and synonymous with the people, the commonwealth.

The uncontrolled burgeoning of urban population which happened at different times and in different places has often blighted this vision, this capacity of the city to nurture the best of what we are. Allied with the cancer of unplanned industrialisation this growth has led to the appalling urban conditions which are the lot of the great majority of people living today, the very antithesis of civilisation. But the city can never forget that the wilderness outside the walls is the source of human life, something well-defined for instance by the norms of the ecocity movement. ‘It must not strain the carrying capacity of the land or lands to which it is economically and ecologically tied. It must not take more from the earth than it can put back, and what it does put back must be digestible. It must not impinge too much on the wild places on whose ecological mercies it depends. Of the technologies and design forms that can help it live within these bounds some may be based on the close imitation of nature, but others may abstract from nature in outrageous ways. No rules can tell you in advance which will work better or which will make for a more satisfying urban life’ (Eisenberg, 1998). And though of its very nature it stands separate from the wilderness, when we create (or enter) the city the human heart within its walls still beats to the tempo of the wild, of nature beyond the walls, because that is what evolution has shaped us for.

One thing we are becoming increasingly conscious of is that it is important to take account of human evolution in assessing the function of landscape in our lives. Our origins are in East Africa, and our distinctive human physique is attuned to this particular natural world of our origins, which is almost literally an extension of our physical being: this savannah landscape of "open grassland, scattered copses, and denser woods near rivers and lakes, with wide vistas that provided the space to plan distant moves, while the trees and promenences offered places from which to track moving animals, as well as visual surveillance of other human groups" (Butzer, 1977). The flicker of a wild animal against the line of trees at the edge of the forest is an extension of the line of our eyes; the messages in the chorus of birds an extension of our ears, for our eyes and ears have been shaped by a precise evolution to respond to these things, attuning us ever more closely to them. Our feet are made for the touch of grass and the earth, our hands for its feel, our nose to smell this precise world. Just as surely as we are physically shaped for this world of nature, so too are we psychically made for it, and this symbiosis of nature and the human psyche is genetically coded as surely as our colour vision and the shape of our hands and face. It is not something we can shake off, a skin we have outgrown, but built into our genes over the millions of years during which our humanity evolved (Heerwagen and Orians, 1993).
A few tens of thousands of years ago we moved out of Africa, to slowly conquer the world. But we also took Africa with us, because wherever possible we have shaped the natural landscapes we made our own to resemble those in which our minds as our bodies are most at home. For a long time fire, the axe and the goat were the tools with which we shaped Nature to our way, then the plough. But all through our long prehistory and history, Nature was always on our doorstep - no longer it is true the untamed wilderness, but the experience of trees and flowers, birds and wind and stars, rocks and the sight and sound of rivers and the sea - which satisfied our deep psychological need. The places where Nature still breathes awake in us memories of a deeper childhood. The flowers and trees in every hedgerow awake them, the singing of the birds, every rock outcrop shaped by time and the elements, every stream that follows the form of the land.

Many people live in a prison of deprivation they don't recognise as a prison, because they have been born in it. The experience of woods carpeted with wood anemones and bluebells should be part of the birthright of every child: the opportunity to catch for a moment an echo of the magic and wonder of the woods of that deeper childhood. We don't know enough about our nature as humans to be able to measure or judge the deeper psychological and spiritual effects of its loss (Feehan, 1995).

Our mind and spirit as our body are most at home in the traditional agricultural landscape which is the cultural counterpart of the open natural landscapes of our origins, endlessly varied in response to different geographies and climates, and to the different traditions into which mankind developed in a new process of cultural adaptive radiation. This traditional rural landscape was our paradise. Always slowly changing and evolving, for landscape is never still, but changing at the pace which allowed the balance to be maintained. Just as is the case with the broader cultural tradition, which may well drown in the flood of resources imported from more aggressive economies, because the continuity of tradition requires change to be slow, allowing adjustment at a pace commensurate with human psychology and the pulse of human generations.

Our 'created' landscapes are an extension of this; they reflect this psychical function of the inherited landscape. These 'created' landscapes are more fully under our control, but the aesthetic which is reflected in parks and gardens unconsciously paints that first human world of paradise in East Africa in the same way. That invisible, unconscious hand is there whether it is guiding the response of the community in the slow way it responds to nature in shaping the inherited vernacular landscape, or whether it expresses itself through the inspiration of the individual landscape architect. The landscapes of classical art, the landscapes in which the great sagas and myths unfold, are savannahs, forest edges, pastoral landscapes, which echo the same psychogenetic depths. The pleasure and peace even of highly formal parks and gardens can be traced back to these same roots: though different ways of embodying it usually derive from the insights and talent of extraordinary individuals. Even such highly geometric gardens as those of the Italian Renaissance have their origins - deliberately so in this case - in the landscape. In the tradition of English landscape painting and design the watercolourists led the way with their paintings of ideal landscapes from which the landscape architects then drew their inspiration; these real gardens in their turn were an inspiration for the next generation of landscape painting.

All civilisations have created a variety of parks and gardens inspired from imaginary pastoral scenes, themselves derived from the type of country in which man lived a thousand centuries ago. To a large extent the art of living consists in trying to recapture ancient biological satisfactions in a modern context (Dubos, 1980).

This concept is the foundation of the modern Biophilia Hypothesis, on which there is a growing literature of analysis, but an awareness of it runs right through the writings of many thoughtful earlier explorers of landscape.
The Biophilia hypothesis gives a new depth to our understanding of the function of nature and natural landscape in our lives. The individual landscape of the animal is its ecological niche, the corner of the world for which it is quite precisely made, physically and psychologically in ways which evoke in us an ever-growing wonder: we understand and decipher this adaptation: and psychologically, though this operates in what is still a biologically dark region of which we understand little. The landscape of an animal other than man is almost literally a physical part of it, an extension of its senses, it is what its senses reach out to and connect, it is what it is made for. For most creatures where they are is who they are, so precisely are they made for a specific place. Put them in different surroundings and they are no longer themselves and often cannot survive.

And we too are the same. We may be a little less than the angels, but we have been swept along by precisely the same exhilarating evolutionary maelstrom as all the other species which people this moment of life's time with us, 4,000 million years of life having been spent travelling with them, and before that we have shared the same remote origins in the dust of exploding stars. The chance of evolution shaped our niche for us as the backbone of Africa slowly rose 10 million years ago and the east of the continent dried: this was the world into which we came and in which we grew and which became a part of us we can no more excise from our being than we can blind our eyes. This was the world which has shaped all our visions of paradise.

And so, when we come to create or to re-shape the city we must allow the sights and sounds and reality of nature to permeate the physical fabric: we need to build in such a way that we can find in the city resonances which the psychical and spiritual chords that allow our spirit to breathe and enable us to be whole, can respond to. Cut away from nature we cannot be entirely at ease, because our senses and spirit are so profoundly tuned to its music. Being cut away from it engenders a sense of unease, which under many combinations of circumstances can fester to dis-ease.

And we must acknowledge and articulate this physical, psychical and spiritual continuity within the walls. We cannot do without nature for these deepest of reasons. We may feel we can, but that is in the deepest of senses because we don't know what we are missing, any more than somebody whose entire life has been spent in prison, between four walls, however well-nourished and entertained and amused, misses the sights and sounds of nature for which his soul - genes if you must - cries out, but he cannot hear above the sounds and colours and strobes of noise and media.

It is why the bible for landscape architecture in the city should be the ecology of the bioregion whose arteries and veins must never be blocked at the gates but allowed to flow fully through the city: stream and wood and greensward, bringing continuity and assurance and the sense of being at home in the world, not cut off from our natural roots by wires and glass and cement, however ingeniously engineered. The landscape architect in the city needs to be both poet and ecologist (and dare I say, magician). The city planner needs to be both engineer and landscape architect. And this bringing of nature into the city applies not only to living nature, wet and green, but inanimate nature, the forms of the wild world moulded in earth, rock and water. I have for a long time now been tantalised by the hypothesis that the satisfaction of architectural form has its aesthetic roots very deep in the subconscious where the primate inheritance which account for 95% of our genetic inheritance slumbers.
Outcropping rock was very much a part of the landscape of our origins, and so something our mind and spirit are at home with and respond to because it too touches something deep within us. I think the root of our response to, and apparent need for, temples and cathedrals lies in the way landscapes like those of Africa, with their great natural temples and cathedrals of stone, forgotten perhaps at the surface of our race memory, belong deeply at the root of our spirit. Perhaps there is even an echo of this deep geophilia in the appropriateness we feel about the narrow winding streets and alleys and gutters of older towns and cities, which may be psychological counterparts of the canyons and gulleys of our ancestral world, whose aesthetic evolved through the operation of comparable chaotic processes in ‘orderly imbalance.’

So allowing the heart of nature to throb in the fabric of the city is not only a biological or ecological issue; it also has a geological component that nurtures body and spirit in the same way. The lines of flute and buttress and cornice of cathedral and skyscraper perhaps have their remote inspiration in the dip and strike of outcropping rock, jointed and fissured by time and the elements which carve and hone them into harmony with their particular place. These natural forms are the psychological tendons into which the deeper parts of our mind and spirit most comfortably mortice. They should inform the design not only of those special corners of the city in which the species and processes of nature are allowed to predominate – parks and gardens – but also the modern counterpart of standing stones that we erect at various nodes in the city and which are supposed to fit that lock in our human spirit, which when the tumbles are released lifts the spirit as we hurry past: and our sculpture and street art is, in a literal sense, often less than inspired and inspiring in this way.

I have tried on several occasions myself to find the words to express this radical dependence on nature because of where our species came from and grew up in the beginning. But I think nobody has expressed it better than the great Anglo-Argentinian naturalist W.H. Hudson just over a hundred years ago, and I want to make his words my own:

What has truly entered our soul and become psychical is our environment - that wild nature in which and to which we were born at an inconceivably remote period, and which made us what we are. It is true that we are eminently adaptive, that we have created, and exist in some sort of harmony with new conditions, widely different from those to which we were originally adapted; but the old harmony was infinitely more perfect than the new, and if there be such a thing as historical memory in us, it is not strange that the sweetest moment in any life, pleasant or dreary, should be when Nature draws near to it, and, taking up her neglected instrument, plays a fragment of some ancient melody, long unheard on the earth (Hudson, 1893).

References


Hudson, W.H. 1893. Idle Days in Patagonia. AMS Press, US.
The GREENSPACE Project

Craig Bullock,
Environmental Institute,
University College Dublin

GREENSPACE is a three-year applied research project that is being financed by the European Union under the Framework 5 Programme. The project includes partners in six other European countries and is being co-ordinated by the Environmental Institute at UCD.

The broad objective of GREENSPACE is to assess the public benefits of urban green areas, i.e., parks and all other areas of publicly accessible green space. The focus is establishing the value of different types of green space and their respective characteristics such as landscaping, naturalness, ecological potential, recreational use, facilities, etc. Data will be collected by means of inventories of open spaces and through large-scale public surveys, the results from which will be included in a software based decision support package. The aim is to contribute to the strategic planning and future management of urban green space.

The principal approaches are economic methodologies designed to estimate the public benefits of green space, although the project also includes input from planners, sociologists, ecologists and spatial scientists.

Total Economic Value

Urban green space provides a variety of benefits including recreation, biodiversity protection and heritage value. From an economic perspective, our interest in the GREENSPACE Project focuses on those benefits that are perceived and valued by people. These are ‘public benefits’ to the extent that most are shared, given the accessibility of many urban green spaces and the fact that benefits are not always restricted to within the boundaries of the green spaces themselves.

The benefits can be categorised as in the table of Total Economic Value below. Benefits include use values, which are direct in terms of their realisation or through active participation by people, or indirect in that green space contributes partially or indirectly to other benefits. For example, a cycle-way through a linear green space (or greenway) provides direct use benefits in terms of recreation and health, but also indirect benefits by reducing road traffic when people are shifted from vehicular travel (i.e. commuting) to cycling. Similarly, green space may protect biodiversity and this indirectly supplies a direct use benefit to the extent that people appreciate nature and enjoy seeing birds or animals. If society further feels a sense of stewardship or responsibility to the environment, then biodiversity also has an existence value in itself.

In addition, economists recognise the presence of option values (Bishop, 1982). These are a type of insurance policy in that people may value the option to use a place in the future even if they do not use it at present. The value is commonly attributed to assets such as animals or wilderness that people may not have experienced yet, but hope to in the future. It can also apply to urban green space, including the role that such spaces have in preserving land for potential socially useful development in the future. Obviously, where we value existing green spaces we might wish that these be preserved for ourselves, others and future generations. However, the potential development value of much urban green space, especially in present day Dublin, is also a reflection of its cost (i.e., opportunity cost) in terms of its alternative use.
Table 1: Total Economic Value

<table>
<thead>
<tr>
<th>Direct use values</th>
<th>Indirect use values</th>
<th>Other values</th>
<th>Existence values</th>
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<tr>
<td>Active recreation</td>
<td>Biodiversity protection</td>
<td>Options values</td>
<td>Biodiversity</td>
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<tr>
<td>- including team sports</td>
<td>Heritage preservation</td>
<td>Vicarious: community cohesion, etc.</td>
<td>Landscape</td>
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<td>- including fishing</td>
<td>Drainage</td>
<td>Bequest: generational</td>
<td>Heritage</td>
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<td>Passive recreation</td>
<td>Community cohesion &amp; identity</td>
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<tr>
<td>- including by disabled</td>
<td>Protection water quality</td>
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<td>Children’s play</td>
<td>Air filtering - health</td>
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<td>Social interaction</td>
<td>Climatic cooling</td>
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<td>Wildlife appreciation</td>
<td>Reduced road traffic</td>
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<td>Landscape appreciation</td>
<td>Tourism income</td>
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<td>Heritage appreciation</td>
<td>Sports training</td>
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A short history of green space in Dublin

The design and planning of parks and green space provision has coincided with the development of urban planning as a formal discipline in modern times. The establishment of genuine public parks in Dublin dates from the turn of the century, a time when cities throughout the world were looking for means to counter the less appealing aspects of industrial development. In 1914, a competition to design the 'Dublin of the Future' was won by Patrick Abercrombie and his students Sydney Kelly and Arthur Kelly (Abercrombie et al., 1922). Their winning design dealt with many of aspects of urban design, but their recommendations for green space were inspired by the prevailing ideas of the time, including the likes of F.L. Olmstead’s ‘green necklace’ plan for Boston. The Dublin plan envisaged a radial network of parkways linking Phoenix Park with the coast by means of the city’s main rivers.

The Abercrombie plan was never realised in its entirety, in part due to the intervention of the First World War and its instigators’ failure to appreciate the expense involved. However, Dublin was not entirely excluded from international trends. Soon after it received its first ‘garden suburb’ at Marino which, despite being overwhelmed by the city’s subsequent expansion, remains an intact and distinctive neighbourhood.

In subsequent years, housing needs exerted an increasing influence on planning, particularly following Ireland’s first comprehensive Town Planning Bill in 1929. After the Second World War, parks provision receded as a priority and green space increasingly became an afterthought to be located between land allocated for housing or for roads. The influence of engineers was evident in the prevailing culture of specification which specified the exact areas to be set aside for housing, roads and green space (Cregan, 1989). The Dublin County Development Plan of 1972 recommended that 10.2 acres (4.13ha) per 1000 population, or a minimum 10% of total site area, be retained as open space. It also specified that there should be a hierarchy comprising neighbourhood parks, local amenity parks and playlots. This hierarchy was largely intended to meet the needs of physical recreation and mechanised maintenance, and remained fairly intact over the years.
Dublin’s first Parks Department was established in 1972 and staffed principally by trained horticulturists. The predominance of horticultural practices in parks management has sometimes been criticised for producing parks that are inappropriate to modern needs with maintenance regimes which are expensive to sustain. The latter situation was exacerbated by the abolition of domestic rates in the 1980s and the dependence of local authorities on central government for annual grants. These two factors have caused many of the former private estates, or demesnes, that were inherited by local authorities to be subjected to a rather bland maintenance regime that has eliminated much of their individual distinctiveness.

Probably the single major event in the city’s planning history was the Wright Report (Wright, 1966) which prepared for the development of three major new towns on the city’s western periphery. The design of Tallaght, Lucan/Clondalkin and Blanchardstown conformed to the prevailing design format in that they were predominantly low density developments that acknowledged people’s reliance on the car. For the spaces between these new suburbs the Wright Report recommended the provision of amenity green space or maintenance of countryside wedges.

Areas of poorly planned green space filled the gaps within parts of the new suburbs. Vacant corners corresponding to roadside corridors, sewers, or overhead pylons were grassed in conformance with engineering principles. Beyond these considerations, open space was allocated little functional role. Green spaces, including designated parks, were numerous but of low quality. Typically they consisted of large areas of grass interspersed with isolated trees that often suffered from vandalism. The position has been exacerbated by local authorities’ concern with public liability and fear of injury claims with the outcome that many recreational and play facilities were withdrawn.

The situation applies throughout much of the city, though perhaps especially in the northside where local authority or lower quality housing has been placed alongside large areas of featureless grass. Inadequate parks budgets compounded by problems of anti-social behaviour and vandalism contribute to the prevalence of such empty space. The situation appears to be repeated in the new suburbs where the sprawling nature of low density housing coincides with large areas of open space. However, while these green spaces have yet to mature, there appears still to be an acceptance of quantity over quality.

**The current situation in relation to the benefits of Dublin’s green space**

Despite its prevalence, the foregoing image does not imply that Dublin’s green space is of generally poor quality, be this in terms of design or facilities. Dublin has over 5,000 hectares of parks (Boylan, 1989) including many excellent examples such as Merrion Square, Iveagh Gardens, Marlay Park or St. Anne's Park. In addition, Dublin is endowed with the suburb natural asset that is Dublin Bay while possessing attractive sandy beaches to the north and the Wicklow Mountains to the south.

Nevertheless, it could be asked to what extent Dublin’s parks and green spaces are supplying the various public benefits identified in the table of Total Economic Value above. Some aspects are arguably under-provided. There are, for instance, few good quality adventure playgrounds for children. In addition, while many of Dublin’s green spaces have an interesting history, this is rarely preserved or combined with interpretation facilities. There are also few functional greenways that could be used by walkers or cyclists and even fewer attractive pocket areas of green space in inner city suburbs, either in older housing estates or recent urban renewal.
Biodiversity does not appear to be well-provided for. There are certainly areas of undisturbed riverside or woodland habitat, for example along the Dodder River and the Liffey. However, there is little evidence of active management in either these areas or in parks. In the latter, many shrubs have been removed and replaced with an emphasis on tree planting in response to fears of crime or assault. This is unfortunate, as while it is clearly a very real concern for users, people reportedly value the presence of natural areas, wildlife and adventurous play areas for children.

The potential contribution of the GREENSPACE Project

We have very little idea of what types of green space best meet the needs of the population of today’s Dublin. There have been a variety of surveys of park users and also exercises in public participation such as the Dublin Regional Authority’s well-regarded SRUNA project. Many of these surveys have confined themselves to general likes and dislikes, though. None appear to have undertaken a detailed analysis by user group such as by age, sex or community. On the other hand, there have been some commendable dissertations by students within the Planning Department at UCD (Richview) that have examined how residents use and relate to parks.

The GREENSPACE Project will establish the value that residents place on some of the key characteristics of the city’s parks and green areas. Two principal methodologies are being employed: a) economic choice experiments; and b) factor analysis. The former requires respondents in a survey to choose between systematically-varied packages of green space attributes such as levels of naturalness, facilities, etc. By including an attribute of travel time, and simultaneously estimating a value of time, the relative value of these attributes can be quantified in monetary terms. This allows for direct comparison of attributes’ value as well as potential inclusion in a cost benefit analysis.

The factor analysis can accommodate a larger selection of attributes than can feasibly be included in the choice experiments. The method relies on people to provide a rating of the various attributes and then draws out the key constructs which lie behind these relative ratings.

Both the choice experiments and factor analysis will be followed by a process of public participation, including a series of focus groups. The data from the analysis will be used as input to these sessions which, in turn, will hopefully permit a greater understanding of how people value green space.

In the case of both methodologies, the analysis will not stop at how people value different attributes in isolation, but will examine the reasons why different subsets within the population value them as they do and the interactions that occur between these. For example, one aspect is the relationship between perceived levels of management and people’s sense of safety within parks. This in turn is related to the location of the green space and the type or density of vegetation that is present. Similarly, there is the contradiction between the aspect of security and people’s apparent wish to have green spaces with vegetation that provides for wildlife and exciting play areas for their children.

Early results

The GREENSPACE Project is on-going and will run until the end of 2003. A large-scale survey involving face-to-face interviews with 500 residents in South Dublin is currently on-going, but an initial analysis of the results is not likely until the end of 2002.
However, a series of four focus groups has been undertaken as well as a small pilot survey. In addition, questionnaires for the purposes of the factor analysis have been distributed, although further interviews are currently taking place to ensure a sufficient sample size for reliable results.

The analysis which is available so far suggests that people do indeed value green space. At 45 per cent, the returns from the pilot survey were very good for a postal socio-economic survey and indicate that most respondents value green space and use it with reasonable frequency. Indeed, a question included in an omnibus survey by Lansdowne Market Research for the project revealed that 88 per cent of people in Dublin visit parks at least once per year and that 68 per cent do so on a monthly basis. The proportions were fairly constant between different age groups, gender and socio-economic background. Only older people visit green space relatively (and slightly) less frequently, although it was noted by many older respondents (and has been observed elsewhere (Kweon et al., 1988)) that green space is particularly important to older people as a means of social interaction and for exercise.

Even those respondents who rarely visit green space still value these areas for their contribution to the community and the community’s reputation. If Dublin is similar to cities elsewhere where such surveys have been performed, it is likely that this value arises from genuine altruistic reasons as well as for the contribution of quality green space to property value. Indeed, the contribution to neighbourhood reputation is the aspect which appears to be valued most highly and most often by people. Other green space attributes which people value highly are, in approximate order of preference, “for short walks”, “wildlife”, “adventurous play areas”, “presence of park keeper”, “for others in the community”, “long walks”, “riversides” and “for long walks”. People expressed a desire to have more: walking/cycle routes or greenways, cafes, riversides, wild areas, sports facilities, trees and adventurous playgrounds.

In the case of many green space attributes, the values varied by age group. Younger people aged between 16 and 24 valued playgrounds and sports facilities highly. Those aged 25 to 35 valued quiet areas and water features, i.e., ponds/lakes and riversides. The oldest subset, on the other hand, valued historical features most.

The values were more consistent between respondents with young children and those without, although there were some interesting contrasts such as in the relatively high value which those with children allocated to water features and to meeting people.

In all these cases, the results are preliminary and based on rather small sample sizes of less than 100. In addition, the general results can conceal marked differences. Cafes, for example, were valued by many survey respondents, but others strongly disliked the idea of eating areas spreading to public parks, especially given attendant fears of litter or anti-social behaviour. Once the results of the full factor analysis and the public survey have been analysed, it will hopefully provide a more reliable perspective on the values that people apply to green space, and how green space can be supplied and managed so as to maximise our quality of life.
References


Introduction

Trees are probably the largest living organisms in cities. In their own right, and as a habitat for many other species, they contribute significantly to the biodiversity of urban areas. Through the centuries trees have been planted in urban and suburban areas, parks and streets, and periurban forests and woods. The design and management of such areas is now commonly referred to as urban forestry. This is not a new topic, however, and this paper focuses on arboriculture and the use of amenity trees in and around cities, rather than the forestry or timber production aspect. Attention is given to areas accessible to all people, streets and squares, rather than the development of private gardens or royal parks which were associated with cities and towns.

Tree planting in ancient cities

A few ancient authors and inscriptions refer to planting in the Agora (market), an area adjacent to the Acropolis in Athens. Kimon donated plane trees (*Platanus*) to shade the walks after the Persian Wars had devastated Athens. In 1936 the area around the Temple of Hephaistos was cleared to rock and two rows of rectangular openings in the ground, c. one metre square, came to light. They contained remains of unglazed flower pots. The first planting probably took place in the early third century B.C. and the garden went into disrepair in to first century A.D. The garden was replanted with Myrtle (*Myrtus*) and Pomegranate (*Punica*) (Anon, 1963).

In ancient Rome the great public layouts, civic buildings, temples and amphitheatres were framed with trees. Pine (*Pinus pinea*), which are common in Rome today, may date from that period.

Tree planting in the Renaissance period

In Medieval times, no organised urban greening was undertaken but paintings from the Renaissance period show that trees were a part of the urban fabric. In *View of Delft* dating from 1660/1661 by Johannes Vermeer, trees appear among the buildings of the city. A similar picture, *Long View of London* by Wenceslaus Hollar (1647), shows buildings with gardens and trees on the banks of the River Thames. Trees are seen among the buildings of the city of Bruges in *The Seven Wonders of Bruges* attributed to P. Claessnes the Elder (c. 1550).

Tree planting in Streets, Walks, Promenades and Ramparts

Statutory regulations in relation to street tree planting have been in existence for many centuries. For instance, in 1552 King Henry II of France issued an ordinance for the planting and maintenance of trees in Paris.

In the early 17th century town councils in Low Countries already had some sort of public tree policy. In Amsterdam an expansion plan included of tree planting (Lawrence, 1993 cited in Konijnendijk, 1997).
In the 17th century roads leading out and out of Paris such as those leading to the Tuileries palace, the Cour de Vincennes and the town of Versailles were constructed and lined with trees. They were later enveloped by the developing city of Paris.

**Promenades**

Promenades, together with public parks and pleasure-gardens, were places where citizens walked; a fashionable exercise of the period.

In Paris, the Cours-la-Reine, a 1500 metre promenade planted with four rows elm trees, was created in 1616 along the banks of the Seine. It is considered to be the first example of a promenoir; an artificial or constructed walkway. Marie de Medici had introduced the idea of carriage riding for pleasure to the French nobility. Old plans show the avenue with three rows of trees and a semi-circle for turning carriages. Over the years access to the Cours la Reine varied from free access to authorised access. In 1723 it was replanted.

Another public promenade, the Champs Elysées, with its triumphal arches, was developed from 1670-1723.

An imitation of the boulevards in Paris was seen in Toulouse and Bordeaux. In Lyons and Montpellier two esplanades were planted in honour of King Louis XIV. In Strasbourg, as early as 1681, a Tilia avenue was planted. Tree lined avenues in urban areas hardly existed before 1700-1720. However there are examples at Cours Mirabeau in Aix en Provence, originally planted with Ulmus and later with Platanus, which remain today. A study of Brittany records that from 1675-1791, 54 promenades were created in 28 town in the province.

The practice of promenading was also popular in 16th century Spain. In Seville from 1583 there was a promenade or parade area known as a ‘paseo con alamos’; a parade with poplars (Populus) (Girouard, 1985).

With the exception of Lucca where the ramparts were planted in the 16th century, tree-lined promenades were not introduced in Italy until the 18th century (e.g., in Turin, Parma and Naples (Rabeau, 1991)).

Promenades were also laid out in London. The one at Moorfields was developed from 1606 and 1616, with gravelled walks, benches and avenues of Elm (Ulmus). (Girouard, 1985)

In the 16th century after the Reformation the Swiss city of Geneva constructed bastions and ‘courtines’ close to the medieval ramparts. These areas were embellished with elms, limes, ash and walnut. Towards the end of the century under the influence of their French neighbours, promenades became important in the city. The promenade of the Treille, dating from 1516, is considered to be one of the oldest walkways in a city. Detailed information about tree planting from the mid 16th century on this promenade is given in Silva (1996). Lime (Tilia) and Elms (Ulmus) were firstly planted, to be replaced later by Horse Chestnut (Aesculus). Silva also describes the role the Promenade also had in the life of the city as described by Church documents and by writers of the day. From 1808, a tradition developed where once a particular tree, known as ‘Le Marrionnier Officiel de la Treille’, came into leaf then Spring had arrived officially (Silva, 1996). This tradition continues today and is an example of a particular tree’s cultural and historical significance in the life of a city.
A similar area for promenading occurred at the Jungfernstieg in Hamburg. A tradition which continued to the 19th century as evidenced in the painting *The parade on the Jungfernsteig* (c.1820) by Christopher Suht, which shows people boating and walking beneath trees.

**Ramparts and Bastions**

In the late 16th century ramparts rather than city walls were constructed around some European cities. In provincial French towns, ramparts no longer necessary for military purposes were planted with trees. Trees planted on ramparts with people sitting beneath them looking at the festivities are seen in *Carnival on the Ice* outside the walls of Antwerp by Denis van Alstoot. In an engraving by Mathieu Merian (1646) *View from the Quay at Frankfurt-on-Main*, a row of trees on a rampart is in evidence. A later painting *Rampart Walk at Vienna* by P.D. Raulino (1824) shows rows of Poplar-like (*Populus*) trees on ramparts with people promenading beneath.

**Pall Mall**

Some tree-lined avenues in cities had their origin in the game ‘pallo a maglio’ or Pall Mall, where a lawn was surrounded by trees to facilitate a game similar to croquet.

The tree-lined avenue Unter den Linden in Berlin extends from the Brandenburg Gate to the Opera House and the Humboldt University and is one of the set pieces of city tree-planting in Europe. The scheme had its origin in the game of *pallo a maglio*, where a lawn was surrounded by trees to facilitate a game similar to croquet. It was later used for military parades. Approximately one kilometre in length, it had been planted with Nut (*Juglans*) and Lime (*Tilia*) trees in 1647 (Girouard, 1985). Various views from 1652 to the 1800s shows tree in parallel, four and six rows. The scheme exists to this day with replanting taking place as necessary.

**Town Squares**

The town square, place or piazza had its origins in 16th century Italy, where they were left unplanted. However as this architectural form was translated into other European cities they were planted with trees. A walled square with trees planted on two sides of the square are prominent in *Widow Processing in the Groenplaats by the Cathedral, ntwerp* (c.1600) by an Anonymous painter. The cathedral and square remain, though with fewer trees. In Germany squares in Cologne and Frankfurt were planted from 1572 and 1580 respectively. A *Street scene in Cologne*’ (c.1670) by J. van der Heyden (1637-1712) shows street tree planting with a square in the foreground and buildings in the background.

Five large trees dominate the painting *The Grote Markt* at the Hague by Paulus Constantijn La Fargue (1729-1782). They obscure the view of the houses surrounding square and provide shelter the many buyers and sellers of market produce. A square in Bordeaux was planted with Elm. In a general view of the Palais Royal in Paris built in 1780 – 1784, the square has been planted with formal rows of trees; a feature which continues to the present time.

**Industrial Planting**

One of the few examples of tree planting in industrial areas of a city is seen in *The Howland Great Wet Dock near Deptford, London* (c.1700). This engraving of a large commercial dock was in use from 1703. In an otherwise agricultural landscape with field and animals, the rectangular dock and associated buildings are lined with a double row of trees.
Recreational Areas

In Amsterdam in 1682, the city council laid out a recreational area known as the Nieuwe Plantage, divided into fifteen squares, each lined with a double row of trees. The squares became allotments and people strolled on the broad walkways. A painting dating from 1725 shows an avenue lined with tall pleached trees, not unlike those in the Schronbrunn Palace in Vienna today.

In France during the Intendency of the Marquis of Tourny (1743-57,) promenades of trees were planted around the city of Bordeaux and a public garden was constructed.

In Austria Emperor Joseph II laid out the Augarten in Vienna for public use in 1775. The Prater was opened to the public from the 1780’s.

At Magbeburg in Germany, 50 ha. of fortifications were planted for public use by Peter Josef Lenné (1789-1866). Lenné was also responsible for the development of public parks in Berlin. Lenné prepared schemes for the remodelling of the Tiergarten, (formerly a Crown property) in 1818 and 1832. Two of Lenné’s most forward looking schemes seem to have been forerunners of the park-system idea: his Verschönerungsplan (embellishment plan) for Potsdam in 1836; and his Schmuck- und- Grenzzüge proposal for Berlin of 1840. The latter seems to have aimed at a ring boulevard linking an elementary park system. This idea was seen later in the work of Frederick Law Olmsted in Boston in the United States.

European cities

A book of plans, *Comparative Urban Design Rare Engravings 1830-1843*, provides an early 19th century view of principally European cities (Branch, 1985). The plans first published by the Society for the Diffusion of Useful Knowledge in London are discussed in some detail by Branch. While their main purpose is to show urban design, they also provide an interesting view of trees planted in streets and parks. Some surrounding woodland can also be seen. These maps also corroborate much of the information derived from paintings and written sources. They give a view of cities before the main developments of Haussmann and his contemporaries.

From parks and open spaces to integrated design

In the 19th century, as part of the rebuilding of Paris by Emperor Napoleon III between 1848 and 1870, tree planting became evident as part of the integrated development of parks, open spaces, city squares and boulevards. The work of Baron Haussmann in Paris included the development of parks and gardens and the planting of boulevards to improve traffic circulation, the appearance and amenities of the city of Paris and enhanced military access. Precedents for Haussman’s work can be seen in the development of the 17th century formal baroque designed landscapes of André le Nôtre for King Louis XIV at Versailles.

The ownership of the Bois de Boulogne passed from the Crown to the City of Paris and was intended to rival Hyde Park and other Royal parks in London. It extended to 833 ha., including a pine forest, several oak groves, the gardens of the Bagatelle, two large lakes, the Longchamps racecourse and a zoo. The dates of redevelopment were 1852-1858.

Haussmann also designed and developed a park to the east of the city; the Bois de Vincennes (1860). This had been an existing woodland and extended to include new plantations, three lakes, buildings and a racecourse as in the manner of the Bois de Boulogne. The two parks were linked by tree lined boulevards and a series of smaller parks, similar to city squares in London. Buttes Chaumont in the north and Parc Montsouris to the south, with 24 garden squares between the boulevards and blocks of houses, were also developed.
Champs Elysees was remodelled by Baron Haussmann in 1858 as part of the rebuilding of Paris by Emperor Napoleon III between 1848 and 1870. In that period some 85,000 trees were planted, primarily Plane (*Platanus*) (41%) and Chestnut (*Aesculus*) (15%) (Hennebo, cited by Konijnendijk, 1997). Some 110,000 trees were planted along 236 km of streets. Alphand, the Director of the Promenades service, said ‘It is no exaggeration to say that the Promenades service has completely renewed the appearance of Paris’ (Stefulesco, 1996).

Among paintings and engravings there are many examples of trees as part of the city of Paris. An engraving by Aveline, *The Cours la Reine*, shows four rows of trees with carriages and people beneath. An aerial view of the *Cours on the Boulevard St. Antoine* dating from the mid 18th century shows a double row of trees on either side of the boulevard. Paintings by Monet, Pissaro and Renoir and various engravings show the extent of tree planting in the city in the late 19th century.

A similar scheme was undertaken in Brussels by Victor Besme on the instructions of King Leopold II. From 1866, broad avenues and new districts were created in the city and on many of the roads leading to the surrounding countryside. L’avenue Louise dates from 1870 and L’avenue Tervuren from 1897. The principle species planted were Plane (*Platanus*), Lime (*Tilia*), Horse Chestnut (*Aesculus*) and Sycamore (*Acer*) (Morceau, undated).

The Ringstrasse in Vienna was created by Emperor Franz Josef in 1857. A c.3 km boulevard with trees and other vegetation surrounded existing and new civic buildings and still exists today.

**Woods, parks, open spaces and trees in Europe in the modern era**

Ebenezer Howard’s *Garden Cities of Tomorrow* proposed the idea of a ‘garden city’, where the city would be laid out in concentric circles with gardens and greenery to the fore. In 1902 a Garden City Association was founded in Britain. Letchworth, the first garden city, was constructed in 1902-1903. Hampstead garden suburb was developed in 1908, and Welwyn Garden City in the 1920’s. A similar movement, Deutsche Gartenstadt-Geggellschaft, was founded in 1902.

Tree planting at the side of roads in a residential area is a feature of *The Avenue, Sydenham*, (London) by Camille Pissaro (1830-1903) and a poster of the London Underground at the turn of the 20th century.

**Public participation in tree planting**

Prior to the late 19th century most tree planting was undertaken by landowners in their forests and private parks and gardens or by order of a king or government. In the late 19th century and early 20th century local people promoted the planting of trees in woodland and in city streets.

The Roads Beautifying Association published Roadside Planting in 1930 and the Irish Roadside Tree Association published Roadside Trees in Town and Country in 1935. Both books were illustrated and outlined the function of trees in streets and country roads along with the selection and planting and suitable species. These associations were willing to give advice to County Councils and other authorities about tree planting.

Street-tree planting was an issue brought to the attention of engineers in Britain and Ireland of the 1920’s and 1930’s. In 1928, W. Dallimore of the Royal Botanic Gardens, Kew read a paper on roadside trees to the Institution of Municipal and County Engineers. In 1934 the same Institution held a Public Health Congress in London. One of the speakers, William Balfour read a paper entitled *Planting and Care of Roadside Trees* in which he discussed the planting, selection and pruning of trees (Balfour, 1935).
In 1946 the U.K. Ministry of Town and Country Planning issued a circular to local planning authorities concerning tree planting in roads and streets in urban and suburban areas. This is an example of a government policy which supported urban tree planting.

**Conclusion**

Trees have been part of the urban environment for centuries. What are spoken of today as the benefits of urban trees/urban forestry have been known for many years, though the expression of these benefits has been altered somewhat. The social aspect of the use of trees and tree-lined parks and walks where people congregate and engage in business or leisure has a long tradition in Europe. In the past a limited range of trees has been used in urban areas. Though a wider selection of tree species and cultivars developed for urban areas are now planted in cities, there is still a major reliance on a few genera such as Plane (*Platanus*), Lime (*Tilia*), Horse Chestnut (*Aesculus*) and Maple (*Acer*). In the past many trees were lost due to Dutch Elm Disease (*Ophiostoma novo-ulmi*) and at present *Cameraria*, a butterfly native to Macedonia, is causing serious damage to Horse Chestnuts in Europe.

Research concerning urban trees in 22 European countries is outlined in *Research and Development in Urban Forestry in Europe*. This publication is a result of an EU-funded Cost Action named *E12 Urban Forests and Trees* (Forrest *et al.*, 1999). It describes the range of research work being undertaken in the areas of planning, establishing and managing trees in and around cities. Members of the Cost Action are also involved in the preparation of a reference book about urban forestry in Europe due for publication in 2003.
References


Communities in Green Space

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Involving communities in decision-making processes relating to their local parks and green spaces can be both challenging and rewarding for all: landowners, communities, and local organisations. The case study below explores the possible levels of involvement through theory and example.

The organisation Envolve works in green space with many partners and through partnership arrangements. These partners include young people, local residents associations, NGO’s, other local and national charities, and local and national government. The experience and work in this case study has been with a national charity (The National Trust), local government (Stockport Metropolitan Borough Council), and Envolve (NGO).

Urban green space can have many problems associated with it. One of the main problems is crime, which can lead to the site being underused. Hence no-one in the community feels they have ownership or responsibility for the site. Anti-social behaviour can take place when those using a site are uninspired by the features and facilities available to them, so the users become bored and develop inappropriate behaviour.

Fear of crime can quickly cause a site to deteriorate. It can develop when there is poor visibility on a site, e.g., overgrown shrubs which create restricted lines of vision and sheltered corners. Once a person expresses a fear of crime to another member of a community it can cause others to stop using the site. As fewer people use the site the fear of crime can increase further.

Health and Safety hazards in green space are mainly the result of anti-social behaviour. If user groups are not catered for then bored and uninspired individuals can cause damage to equipment, which may then lead to the removal of what little equipment is available. Other examples of health and safety hazards are dumped and burnt-out cars, smashed glass and needles in sandpits.

Poor biodiversity results in some green spaces due to low maintenance and low budgets. Areas can become known as ‘green deserts’; vast areas of grass that do not provide any form of habitat or create any opportunities to enhance the food chain.

Mistreatment of wildlife is a very sad and difficult problem to deal with. It may be due to a lack of understanding by users, for example fishermen not being aware of how their equipment can cause injury and distress to birds. Illegal hunting can involve highly organised gangs as in badger baiting. It can also be as simple as children throwing stones at birds.

Negative perceptions of an area can develop as large areas of green space are highly visible to visitors, particularly if they are along a town or gateway. If a negative reputation develops regarding a particular area it can take a long time to change.

Through working with communities, urban green space can be transformed into a positive environment and can provide various opportunities. Flora and fauna habitats can be improved through the development of creative planting schemes. Community groups can assist in habitat creation, for example by making and erecting bat- and bird-boxes.
Positive social interaction can take place in any type of green space. It may be informal, such as networks of dog walkers or more formal, such as crown green bowling and community task days.

There are opportunities for educational experiences at all ages and levels of ability. Green spaces are outdoor classrooms that can inform within a curriculum or fulfil specific requirements for hobby or interest groups.

Play and sports provision can also be available to all ages and levels of ability in the community. Traditional forms of play and sports equipment can be installed, e.g., swings and tennis courts. Imaginative spaces can also be created for children to interpret in different ways, as well as installations that allow skate-boarders and roller-bladers to develop their skills.

Health improvements, both mental and physical, are benefits that green space can provide to the local community and those working in this field. Biophilia is the established term used to describe the recognised benefits to mental health of spending time in a positive green space environment, reducing stress levels and general well-being. Spending twenty minutes, three times a week doing physical exercise, including walking, can have vast improvements on our physical health.

Economic growth is related to an area having a positive image. When visiting investors experience interesting and diverse green corridors when travelling to and from sites, it has an impact on their perception of a town or city.

The Ladder of Participation was developed by Sherry Arnstein 1969 in America. It provides the possibility to identify the level of participation of the local community in a project and can be used as a tool to demonstrate the level of participation that is being aimed for, i.e. how far up the ladder the project is hoped to go. It is important to be realistic and honest.

Starting at the bottom of the ladder and moving up the rungs there needs to be an increase in information exchange, communication and power/control of communities.

- **Manipulation and Therapy** is when the decision has already been made and the only reason for providing limited information is to gain public support.

- **Informing** is when the provision of information is all one way.

- **Consultation** is a two-way flow of information and this information may be considered when making decisions, but there is no guarantee.

- **Placation:** the two-way flow of information continues and now begins to involve people in the process but they then need to be hand-picked, articulate individuals, not necessarily representative of the community. No power has been given to the community at this stage.

- **Partnership** working is moving into the citizen power area; power has been redistributed through negotiation. The community shares the responsibility of the decisions made.

- **Delegated power:** the important difference at this stage is that the community holds the majority of the seats that have the power to make the decisions.

- **Citizen control:** the community now manages the process and has full control of the power. There are no intermediaries between the community and access to the funding.
Case study – Friends of Manor Road Community Woodland

The Manor Road Community Woodland is a 21-hectare site on the edge of the urban area of Keynsham, owned by Bath & North East Somerset Council. Envolve was approached by the Council to increase community involvement with the site. A proposal was submitted which assessed the current level of participation (*informing*) and outlined potential ways to move up the Ladder of Participation.

It was important for the partners to meet to discuss various issues before the project started. These issues included motives; when anybody decides that they want to actively increase the levels of participation within a community on any project it is important that the motives are known and understood at the beginning. The motives will surface at some point and if the community view them negatively it can be highly detrimental to a project; it can even bring the project to a halt. For example, if the only reason an organisation includes a community is to access funding then this should be clear at the start. In this case it was one of the objectives but not the main one.

Establishing the level of control available to the community helps all partners to work towards the same goal and prevent misunderstandings should problems arise. For example, when asked to review the draft management plan for the site, we understood that the group could not change the principles of management but *could* influence what actions took place and their level of priority.

Also, raising concerns at the beginning can reduce problems. At the start going through the process of allocating adequate resources - financial, human, physical and time - makes it possible to understand which partners are providing which services. Envolve were to organise all community meetings and other partners were to organise all task days. Finally, the partners drafted an action plan which, after a review by all partners, was adopted.

One year on at Manor Road Community Woodland a great deal has been achieved.

**Events – on site**

Two open day events to promote the Friends group (attended by 150 local community)

Task days – tree maintenance, hedge planting, and pond clean-up (8 days x 15 people = 800 hours on site)

Training day – habitat surveying (40 people attended)

**Community involvement**

- Meet every month – discuss activities on site, then business (20 core group)
- Developed understanding of biodiversity, Local Nature Reserve Status, Disabled access
- Reviewed management plan
- Researched historic names now used for all compartments of the woodland
- Developed and adopted a constitution
- Promoted their Friends group at the local music festival
Establishing the Friends of Manor Road Community Woodland has

- possibly reduced negative impacts on site
- created a visible impact on site
- developed local community links
- enabled education of local people
- created understanding and tolerance between different users
- increased community participation, from consultation to partnership

References

Europe's Largest City Park: The Phoenix Park, its Functions and Management

John McCullen,
Dúchas,
Phoenix Park,
Dublin

General Description

The Phoenix Park is located 2.5 km west of Dublin City; measures 707 hectares; is bounded by a stonewall 11 km in length; and has 32 km of roads. The landscape is dominated by broad expanses of grassland and separated by clumps of trees. Visitors are offered a variety of landscape experiences as well as spectacular internal and external views and vistas. The Park contains a number of important residences and institutions together with important monuments and historic buildings.

Historical Background

The Phoenix Park was established from 1662 onwards by one of Ireland’s viceroys, James Butler, Duke of Ormond, on behalf of Charles II. Conceived as a Royal deerpark, it initially included the original demesne of Kilmainham Priory south of the River Liffey, but with the building of the Royal Hospital at Kilmainham, which commenced in 1680, the Park was reduced to its present size, all of which is now north of the river. In 1747 the Earl of Chesterfield, having considerably improved the Park, opened it to the public. The Phoenix Park, through the centuries, has gradually been transformed from an outlying country estate to an integral part of the city of Dublin and its environs.

Management

The Phoenix Park has been managed by Dúchas The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands since 1996 and before this by the Office of Public Works since 1860. The Park is managed and controlled under the Phoenix Park Act 1925, which provides that the Park shall be maintained as a public park for the general purpose of the recreation and enjoyment of the public.

After the recent general election Dúchas The Heritage Service is now responsible to the Department of the Environment and Local Government.

In 1986 a Management Plan was drawn up for the Phoenix Park in which four management objectives were outlined:

- Conservation of the historic landscape
- Public appreciation and enjoyment
- Nature conservation
- Management and development of the Park to be in harmony with the local communities.

Under this plan, the Park was designated as a National Historic Park by the Government.
**Landscape Zones**

The Phoenix Park divides into various landscape zones including intensive recreational zones, passive recreational zones, a natural zone and special users zones.

**Intensive Recreational Zones**

This is largely concentrated at the lower end of the Park nearest Dublin City and caters mostly for sporting activities and visitors to Dublin Zoo. The People’s Flower Gardens, the Bandstand and the Kiosk are also included in this zone. Other intensive zones include the Papal Cross area where 1.25 million people gathered for the Papal visit in 1979. The Phoenix Park Visitor Centre and playing fields are also designated as intensive zones.

Visitor numbers vary, but recently it was estimated that annual visitors could be in the order of nearly 1.9 million per annum. This obviously depends on events such as the Irish Soccer Homecoming with 100,000 attending and a family concert which attracted 70,000 people.

**Passive Recreational Zones**

This zone covers a large area of the Phoenix Park and caters for a range of activities from walking and nature watching to photography and jogging. A visitor survey carried out in the Park showed that over 70% of respondents indicated that peace and quiet and the rural effect was their main enjoyment of the Park.

The natural zone is located in the North West corner of the Park and includes the wildlife information centre at Knockmaroon and the nature trail. Priority is given to wildlife conservation and habitat protection. The management strategy here is to minimise the amount of landscape maintenance and encourage natural decay of fallen trees and the growth of waterside plant communities. Some of the management proposals for this zone include the natural regeneration of woodland with an understory of herb and shrub layers, thus providing a rich food and shelter source for bird and animal life.

**Special User Zones**

A number of important residents and institutions are housed and located within the Park. Among these are the President of Ireland, U.S. Ambassador, St. Mary’s hospital, Garda H.Q., Ordnance Survey of Ireland, Phoenix Park Special School and Civil Defence.

The challenge to management is to accommodate as many users without damage to the fabric or infrastructure of the Park and reconciling different user groups, i.e., model aeroplanes vs. people seeking peace and quiet.

The restoration of the Phoenix Park, begun in 1986, aims to achieve the early Victorian overlay of landscape designed by the famous English landscape architect Decimus Burton. Considerable progress towards this has already been achieved with the resiting of the Phoenix column and the conservation of tree groups initially planted by Burton. Other improvements include the refurbishment and addition of gas lights and the phased closure of eight internal roads to vehicular access, resulting in a 50% drop in accidents. The main avenue, also known as Chesterfield Avenue and realigned by Burton, has recently been replanted as a millennium project.
Fallow Deer

The herd of fallow deer first introduced into the Park in the 1660’s is a major public attraction and a valuable research resource for University College Dublin’s Zoology Department. Considerable research has taken place on the genetics of the herd and has resulted in Ireland being one of the world leaders in this work.

The herd numbers approximately 600 in number and are culled to reduce herd size.

Unfortunately considerable damage is caused by deer to the Park’s vegetation particularly its tree population. Consequently trees require protection against the Park deer.

Grassland Management

Up until 1983, the grasslands of the Phoenix Park were largely maintained by grazing animals which were mainly cows. Post 1983 a regime of topping was introduced and in 1986 haymaking became the norm and has continued uninterrupted since. No fertilisers are added and all cut vegetation is removed except for the more intensive mown areas adjacent to the road. A slide taken in the 1960’s shows the dramatic flora produced by grazing animals. The slide also shows the harmonious relationship between cows and deer in the Phoenix Park.

Valuable grassland research has been undertaken by the Botany Dept. of T.C.D. and a major botanical survey of the Phoenix Park has been undertaken by the Dublin Naturalist’s Field Trust, and written up by Paddy Reilly in the *Wild Flowers of the Phoenix Park* (1996). One of the rare plants, *Spironthes spiralis* (Autumn lady’s tresses), first recorded in 1833 still grows in the Park.

Birds

Over 50 species of bird have been recorded in the Phoenix Park by the Liffey Valley group of the IWC. In a private study some 30 pairs of sparrow hawks were found to nest in the Phoenix Park as well as two nesting sites for long eared owls who prefer scots pine (*Pinus sylvestus*) as a nesting habitat. Other animals such as foxes, badgers, rabbits and some mammals also frequent the Park, as do six different species of bat.

Trees and Woodland

There is approximately 30 per cent tree cover of the Phoenix Park consisting of approximately 230 hectares of woodlands and 20,000 trees in avenues and roundels. The trees consist mainly of broad-leaved deciduous trees with some coniferous and evergreen plantations. Approximately 10,000 new trees have been planted since 1986.

The conservation of tree groups and belt plantings without clear felling has been a real challenge, and the size of the Park has allowed a number of options as illustrated on the slides. Every opportunity is seized at involving local communities and schools in tree planting.

One of the many value and functions of trees in urban areas was demonstrated when it was found that on dismantling the Phoenix column there was no need for any form of stone conservation. Air pollution was greatly improved by the filtering of the trees.
Trees are a valuable means of absorbing dust from the atmosphere as illustrated on the two diagrammatic slides illustrating Dr. Bernatsky’s work in Frankfurt in 1986 and other American research illustrated by the slide on Waterloo Rd. in Dublin. Research also shows the capacity of leaves of deciduous trees to absorb gaseous components from the atmosphere, particularly CO₂.

A new draft management plan for the Phoenix Park is almost complete and will be circulated to interested groups for consultation. One of its main objectives will be to focus on the natural elements of the Park and to initiate a comprehensive education programme with schools and other groups.

**Nature Strategies**

To maintain and improve the nature values within the Park a number of conservation strategies are in place.

- Deer management
- Woodland conservation
- Wildflower / grassland management
- Species management

To conclude, a comprehensive full time education programme is under consideration.
I would like to open my brief contribution to your Conference organised by the Urban Forums for Sustainable Development, with the support of the European Commission, by expressing my appreciation for this public debate on Natura 2000, biodiversity and green space in urban areas. I am convinced that your discussions here today will help us in the Environment Directorate-General to better develop our communication action in the field.

In DG Environment, it is obvious that we do not forget that fact that almost 80 per cent of the European population live in cities and towns; and we are fully aware of the key environmental concerns of Europe’s citizens. Data from the latest Flash Eurobarometer opinion poll (conducted in April 2002) show that 82 per cent of Europeans are very worried or worried quite a lot about future trends in nature and wildlife.

According to the results of this survey, EU citizens believe that, in their community, there is every reason to complain about the state of the environment. Most common among the complaints was the problem of ‘traffic congestion and over-reliance on cars’, which preoccupied 50 per cent of the respondents. In addition, ‘damage done to the landscape’ (40 per cent), ‘noise’ (36 per cent), ‘air pollution’ (30 per cent) and ‘lack of green space’ (28 per cent) give cause to concern.

Turning now to Natura 2000, I would like to remind you that Natura 2000 is a Community-wide network of nature protection areas established under the 1992 Habitats directive. The aim of the network is to assure the long-term survival of Europe’s most valuable and threatened species and habitats. It plays a key role in protecting the EU’s biodiversity in line with the Gothenburg decision to halt biodiversity decline within the Union by 2010.

The Habitats directive identifies some 200 habitat types and 700 species of plants and animals of Community importance. The long-term conservation of these species cannot be achieved by protecting isolated pockets of nature however great their individual value. By establishing a network of sites across the full distribution of these habitats and species, Natura 2000 is intended to be a dynamic and living network providing the best possible guarantee for their conservation.

Recognition of the need for a network of this kind was in response to the large scale destruction and fragmentation of wildlife habitats, which has occurred over the decades leading up to 1992. The pressures responsible for this loss, i.e., urban, infrastructure and tourism development, agricultural and forestry intensification, etc. have continued over the last decade.

The Habitats directive outlines three stages in the establishment of Natura 2000:

a) Proposals for sites for inclusion in Natura 2000;
b) Selection of list of sites of Community interest from proposals made by Member States;
c) Establishment and management regimes for the sites.

Despite efforts deployed both at Commission and Member States’ level, to raise awareness and inform the public and stakeholders on Natura 2000, its objectives and implications are still often poorly understood by those concerned and new initiatives are required.
In particular in this new phase of implementing the Natura 2000 network, where countries move forward with management planning, a pro-active communication strategy is needed, with the objective of addressing both stakeholders and the public, so that a positive debate can take place on how sites should be managed. Commission and Member States will have to co-ordinate efforts in this sense.

The responsibility for proposing sites for Natura 2000 lies with the Member States. The role of the Commission is to adopt lists of sites of Community importance on the basis of Member States proposals. The analysis of the Member State proposals is carried out in a transparent way by scientific seminars convened by the Commission and supported by the European Environment Agency. Member States and experts representing relevant stakeholder interests from both landowners and environmental NGOs participate in these seminars.

The Habitats directive did not lay down in detail the consultation process to be followed by Member States in selecting the sites. As a result, the procedures have varied between Member States in accordance with their administrative systems.

In some cases, identification of the sites has been accompanied by detailed discussion with landowners on management measures, but in other cases there has been little or no consultation with stakeholders. This has given rise to considerable controversy in some Member States with the variety of administrative and legal challenges, which have delayed the submission of proposals. The Commission is not involved at this stage and has no powers to intervene in the differing procedures followed in Member States.

Many Member States are now in a process of establishing their national plans on communicating Natura 2000. The Commission will seek to complement their efforts by giving a European dimension to this process.

Beginning in 2002, the Commission has started a debate on how to improve communication on issues related to the implementation of the Natura 2000 network.

In a first meeting on communication (January 2002), the Commission established a working group as a first contact with Member States and other organisations to exchange experiences and ideas on possible strategies for future communication on Natura 2000. In this group there was wide consensus on the need for improving communication for such action. While recognising the importance of initiatives adapted to national and local situations, a general framework of co-operation between the Commission and Member States was seen as necessary to ensure effective action with a coherent and consistent approach throughout the network.

In a first stage the Commission has proposed an initiative seeking for high political commitment. In this new phase of the Directive’s implementation where countries will move forward with longer-term planning for the management of the Network, it was also felt that high political support was needed to promote local level participation in the new phase of the establishment of site management plans.

Beginning in March 2002, a drafting group drafted a first set of principles as a basis for a Political Declaration restating some of the principles already accepted by Member States under the Habitats Directive and aiming, at this stage, to give a strong political signal to support and encourage local level authorities and stakeholders to raise awareness on the network and get involved in the management of sites.

It was thought that this initiative would be particularly welcomed on the 10th anniversary of the Habitats directive and following the approval of the first list of sites for the Macaronesian bio-geographical region. This initiative is now known as the El Teide Declaration.
As a next step the Commission’s working group on Communication will now consider co-operation between the Commission and Member States on communication on Natura 2000 at local level by:

Seeking for complementarity with national communication plans in order to give an European dimension to the Network
Providing a positive message on Natura 2000 – Natura 2000 is about people and development as much as about nature protection
Promoting awareness raising and empowering citizens
Promoting local level involvement and partnership building

The success of Natura 2000 will require the support of European citizens, especially of the local populations, and their participation in the decisions on the management of the areas involved.
Evaluation of the Natura 2000 Network in Finland and Biodiversity in Espoo

Espoo Urban Forum,
Espoo,
Finland

Abstract

The report was drawn up for the annual meeting 2002 of the European Union Network of Urban Forums for Sustainable Development, the theme of which was Natura 2000 and biodiversity in the urban environment. The discussion begins from the national level, proceeding then to a specific city level, the case in question being Espoo. At this point, the report discusses the progress of the Natura 2000 process, the number and quality of sites included in Natura 2000, as well as its economical, environmental, judicial and socio-political impact. The report also evaluates how the process was received by the general public, Finns’ relationship with the natural environment, and the conflict culture of Finnish environment protection while also dealing with the character of the green areas in Espoo and the threats they are facing. The aim has been to describe the impact and reception of the Natura 2000 network, as well as to interpret the value judgments behind the conflict culture in Finnish environmental protection. The report also seeks solutions to the threats faced by Espoo’s urban wildlife. Material gathered from related reports and other written sources have been supplemented through interviews. The present report has been drawn up in Forum Espoo in co-operation with the City of Espoo Environment Centre and City Planning Department.

The Natura 2000 network has included in the scope of environmental protection sites which, unlike previous conservation programmes, had also been protected under other legislation. In other words, the situation in several of the Natura 2000 sites remained unchanged despite the protection decision. Yet the Natura 2000 network aroused strong opposition during the preparation period. This shows that the information disseminated on the significance and impacts of the network was insufficient. The publicity of the Natura 2000 network also instigated debate that was rife with misconceptions. The present paper will, therefore, provide future environmental protection projects with better preparation to take into account the conflict culture in Finnish environmental protection and (by European standards exceptionally strong) values Finns place on forest and land ownership, and the markedly different relationship the rural and urban populations have with the environment.

In Espoo, the Natura 2000 network was positively received. With services being the largest employment sector, Espoo is different from many of the municipalities in Finland which rely mainly on industry, agriculture and forestry. Therefore, the Natura 2000 project posed no threat to the main livelihoods of Espoo’s inhabitants. Espoo is, however, a typical municipality in the context of the Helsinki metropolitan area in that its population is soaring, and the pressures for construction are in direct conflict with environmental protection. For this reason, many of the green areas of the municipality are facing an exceptionally high number of threats, and many environmental organisations are highly critical finding that the number and scope of the sites in Espoo included in Natura 2000 are inadequate. The conflicting pressures in land use are something many European cities are struggling with, and they could provide models on how to solve the question of safeguarding urban wildlife.

The full version of this report can be found on:
http://english.espoo.fi/xsl_perussivu_alasivuilla.asp?path=5731;21831;33886
Introduction

The Finnish Natura 2000 network as proposed in 1998 comprised 1457 areas with a total extent of about 4.77 million hectares, consisting of about 3.54 million ha. of land and about 1.23 million ha. of water. There were 439 special protection areas as designated under the Birds Directive, with a total extent of about 2.75 million ha., and 1326 natural conservation areas, with a total extent of about 4.72 million ha. Some areas of these two kinds were totally or partially overlapping.

A supplementary proposal approved by the Council of State in April 2002 increased the overall number of areas to 1804, of which 87 are located on the Åland Islands, and their combined size to about 4.88 million ha., of which some three fourths, or about 3.57 million ha. consist of land and the remaining 1.31 million ha. of water. The additional Council of State resolution of 1998 covered altogether about 47,000 hectares of privately owned land not previously protected in any way, which was now to come under the Nature Conservation Act. A third of these areas were to be purchased by the state or placed under a protection order.

Costs of conservation

The costs of conservation consist principally of the sums paid for the purchase of land areas and the compensation payable to the owners of land remaining in private hands. Estimates of the potential costs have set out from the assumption that the terms of compensation will conform to existing regulations. Under the Nature Conservation Act and Land Redemption Act, forest owners are to be paid “compensation in full according to current prices”, or if the current price does not compensate the owner fully for his loss, the compensation must be based on the yields to be expected from the holding. If land is acquired under other laws, compensation must be based on the provisions made in those laws. The calculated costs to the state of the supplementation of the Natura 2000 network are about 15.3 million euros.

Financing

It was determined under the programme approved by the Ministerial Committee for Economic Policy in 1996 that the total sum to be set aside for financing nature conservation over the period 1996-2007 should be FIM 3285 mill. The aim is that questions involving the protection of new areas of private land under previously approved nature conservation programmes and in connection with the Natura 2000 network should be resolved in the framework of that budget. The intention with regard to the supplementary proposal was that this should be financed partly within the above programme and partly out of EU community funds. The progress of this financial programme will be re-evaluated in 2005, and if it is evident that further finance is needed to ensure completion of the Natura 2000 network, the programme will be extended by a further year to cover 2008.

Some 30 Finnish projects, virtually all of them involving an element of sustainable nature tourism, received a total of more than 23 million euros, or almost FIM 140 million, in support under the LIFE programme over the period 1995-2000. The greatest beneficiaries were the National Forest and Park Service and the regional environment centres, although universities, local authorities and other organisations were also involved as applicants or collaborative partners. The majority of this finance has eventually come to benefit the economy of the locations in which the projects have been carried out. For further details, see the EU Commission’s LIFE website: europa.eu.int/comm/dg11/nature/home.htm.
Espoo

The Natura sites of Espoo consist of the bird habitats of Laajalahti, and the parts of Nuiksio, Espoonlahti-Saunalahti and Vestra herb-rich forests, bogs and old-growth forests situated in the Espoo area. The additional sites are the Matalajärvi area and the Bånberget primeval forest area. The total size of these areas is 2,636 hectares, the additional sites comprising 130 hectares.

Laajalahti bird habitats

Laajalahti, a shallow, wide and reedy bay in the Gulf of Finland in the east of Espoo, is internationally known for its bird-life. The designated area comprises the actual reed area, as well as former fields and bush on the land side, and some more open water area further out in the bay. The bay and its shoreline incorporate a good ecological set of biotopes. The coastal meadows and fields have been mown and pastured as late as the 1960s, but now they are about to become bushy and overgrown with reeds as well as partly turn into herb-rich spruce swamps. Laajalahti is a significant educational site in the Helsinki metropolitan area. Villa Elfvik in the vicinity houses the environmental education centre of the City of Espoo, offering courses such as the nature school as well as various exhibitions on nature and the environment. The Laajalahti conservation area has a nature trail with its birdwatching towers. The area is also important for bird-life research. The ringing of migratory and nesting birds in the reed and bush area is conducted through the Constant Effort Ringing in Finland and the Acro projects.

Laajalahti is an internationally significant bird habitat, one of the best migration rest stops on the Finnish south coast. The area has about 250 pairs of water-birds nesting there annually. Its migratory significance has only increased in the 1990s, resulting from improved water quality and regenerated flora. Several species included in the Birds Directive rest and nest in the area. Laajalahti is also significant for research. Nesting and migratory birds are ringed in the reed and bush area, as part of Constant Effort Ringing in Finland and the Acro projects.

Nuiksio

Nuiksio is situated close to the Helsinki metropolitan with areas in the municipalities of Kirkkonummi, Espoo and Vihti, less than 40 kilometres from the urban areas. The area designated has a continuous core of more than 5,000 hectares and some smaller sub-divisions. The geology of the area is characterised by Archaic bedrock intersected by numerous fault lines, precipices and glaciated rock, its height varying from 27 to 114 metres above sea level. There are numerous small bogs and lakes in the bottom of the valleys.

The area is a watershed between three small waterways emptying into the Gulf of Finland, and almost independent by their water economy. There are plenty of small and smallish lakes in the area: 90 lakes and ponds, either entirely or partly in Espoo. They are partly oligo-dystrophic ponds with bogggy shores and rich in humus, partly oligotrophic lakes with rocky shorelines, sparse vegetation and clear water. The lakes are connected by smaller streams, with poor discharge. The most significant of these is Myllypuro, flowing through a central fault line. Nuiksio is dominated by various coniferous forests, such as dry pine forests on the rocks and mesic spruce forests. The disconnected bedrock makes the flora subtle and mosaic-like. There are forested bogs on the bottom of the fault lines, dominated by spruce or pine, with birch and common alder as admixed trees. There are alluvial spruce swamps along the streams. The most fast-growing and diverse forests are on the sides and the bottom of the fault lines, with aspen, and at places linden and maple, as admixed trees. There is a variety from dry and sunny lichen rocks to shady and wet moss hills. The stream valleys have formerly cultivated meadows with traditional flora.
The Natura site has no parts with permanent housing. The fault lines have some deserted, gradually overgrowing small-holdings. The area also contains islands of active small-holdings and areas of summer cottages. The oldest known settlements originate from the Stone Age. Almost all forests and bogs have been in forestry use up to the 1990s. The landscape is dominated by the abrupt topography of the rocks with its vantage points, the extended but closely-knit and almost impenetrable forests, as well as numerous small lakes.

Its beautiful scenery and the proximity to the capital have made Nuuksio a popular camping ground for a long time. Since the 1940s it has included recreation areas with lodges, maintained by the municipalities. Picking berries and mushrooms are popular activities in the area. Nuuksio is the largest and the most important area in southernmost Finland for the conservation of Western Taiga, forests in particular. Quite a few of the forests have been in commercial use for a long time, but the area also includes forests in their natural state. Protection promotes the natural development of the forests, and the area will become more significant as a protection area for forest ecosystems. The Forest and Park Service has started restoring the natural state in the forests by burning small areas of old commercial forests.

Nuuksio holds about 50 species of animals and plants classified as threatened in Finland, and more than 30 species listed in the EU Habitats and Birds Directives. This variety is naturally concentrated on forest species. In addition to the large total of species, the numbers of individuals and pairs for single species are often considerable. Populations such as fowl and flying squirrel are large by Uusimaa standards.

About half of the area belongs to the Nuuksio National Park, but the protected area also includes the areas to be annexed to the existing park through the component master plan in Vihti, Espoo and Kirkkonummi, as well as the areas mentioned in the national conservation programmes, in addition to the areas purchased. The areas in Espoo belong largely to the shoreline protection programme. Included is also Punjonsuo, an approximately 150-hectare area owned by the City of Helsinki and used for recreation, to create a good ecological whole. It is not intended to be integrated into the National Park, but its present nature can be preserved and its use as a recreation area can continue. The area would be included in Natura 2000 by an agreement which would more specifically define protection and recreation use can be reconciled. There are approximately 890 ha in total to be included in the national park that are not included in the current conservation programmes. The area covered by the Nature Conservation Act will include 900 ha, and by separate agreements 90 ha.

The area set aside contains the following private conservation areas not included in the National Park: Isosaari in Ruuhijärvi (0.04 ha), Kilpilampi-Lippukallio (30 ha), as well as Saukonoro (4 ha) and Haukkalampi-Romvuori (9.5 ha), included in the herb-rich forest conservation programme. The most significant of the subdivisions are included in the old growth forest conservation programme. These are the Luukki area (170 ha), including the Koivula stream valley of the herb-rich forest conservation programme, most of which is protected as a private conservation area, Pirttimäki (37 ha), with the invaluable Mullkärret fen, and the Hakjärvi herb-rich spruce swamp (59 ha).

Vestra bogs, herb-rich forests and old-growth forests

The Natura site consists of six separate parts at the border between Vantaa and Espoo. The herb-rich wood area of Mustakoski, the old growth forest of Vestra and Herukkapuro herb-rich forest, Isosuo active raised bog, Pyymosa herb-rich forest and Odilampi-Smedsmosen bog are in Vantaa. Tremanskärr bog is in the north-east of Espoo. The area is highly varied. It is in the metropolitan, and is thus also used for recreation. The area forms a very significant concentration of sites well preserved in their natural state in the metropolitan area. The old-growth forests, herb-rich forests and bogs are nationally significant. The area holds several habitat types listed in the Habitats Directive. The most representative are the Western Taiga, Fennoscandian herb-rich forests with Picea abies and bog woodland. The old growth forest of Vestra is relatively large in size by Uusimaa region standards. The ground vegetation represents herb-rich forest and herb-rich heath. The trees are mostly spruces, with birch and aspen as admixed trees. Some of the deciduous trees are aged. There is plenty of decaying fallen trees, mainly spruce of different sizes. The species of the old growth forest have only been studied a little. Threatened species such as the Phellinus populicola fungus have been found in the area.
Herukkapuro is a particularly representative as a herb-rich forest. The vegetation type varies from the dry herb-rich forest of the upper level to the lower mesic herb-rich forest, and humid fern groves and alluvial meadows along the stream. Occurrences of demanding species such as dog’s mercury (Mercurialis perennis) have been found in the area. Pyymosa also has some hazel grove.

Tremannskärr is a varied area of several types of spruce and pine bog, and treeless bog. Isosuo for its part is a smallish active raised bog, the likes of which have only rarely been preserved undrained in the metropolitan area.  
This Natura site is very important for the protection of the flying squirrel. Vestra is the next most important concentration of flying squirrel in the metropolitan area after Nuuksio. Apart from Vestra and the near-by Riiapitä, flying squirrels have not been found elsewhere in Vantaa, although the biotopes are suitable. It is important for the protection of the flying squirrel that a sufficient number of appropriate wood areas close to one another be protected. The area is also important for protecting many species in the Birds Directive. Forest birds dominate, herb-rich and old growth forest species in particular.

Several parts of the area are in the national conservation programmes, confirmed by the Finnish Council of State: Vestra in the old growth forest programme, Herukkapuro and Pyymosa herb-rich forest conservation programme, Odilampi-Smedsmosen and Tremanskärr in the wetland conservation programme. Herukkapuro and Pyymosa, as well as parts of Tremanskärr, have been placed under protection by virtue of the Nature Conservation Act. The Natura area does not affect the regulations concerning protection of these areas.

Espoonlahti-Saunalahti

Espoonlahti-Saunalahti is a bipartite Natura site straddling the border between Espoo and Kirkkonummi. The more considerable of them is Espoonlahti with its 220 hectares, a reed-grown inlet, and an area with a broad-leaved deciduous forests dominated by the small-leaved lime as well as meadows and managed biotopes (Fiskarsinmäki hill), pastured up to the late 1970s. There are three small rivers flowing into the inlet. The Saunalahti area has been included because it is the home of the only known permanent population of the rare beetle Macroplea pubipennis. The species has been known in the area ever since the 1960s, and the population has remained rich. The designated area for this beetle consists of a reed-covered water area of 4.5 hectares, and coastal meadows. Espoonlahti is important, because water and wetland birds nest and rest there on their migrations. The bay has shown rich occurrences of resting whooper swans and smews.

Fiskarsinmäki hill is a nationally significant broad-leaved deciduous forest. Besides the small-leaved lime, the wych elm (declining, near-threatened in Uusimaa region), and the oak are found. The tree stand is old, and several other threatened and rare species live there. A species listed in the Annex II of the Habitats Directive, Dicranum viride moss deserves a special mention as it has been classified as endangered, both nationally and in the Uusimaa region. There are only a few occurrences of this species in Finland.

Saunalahti contains the world's only known permanent population of the beetle Macroplea pubipennis. The species has only been found in Finland. It lives at the outer edge of the reed zone in Espoonlahti at a depth of 25-50 cm. The species was last been surveyed in Espoonlahti in 1995, when the population was classified to be of least concern (Biström 1995). The Macroplea pubipennis has been classified as vulnerable. There have been some occurrences of near-threatened, declining beetle populations in the waters and coastal meadows of Saunalahti in the 1960s and 1970s, such as Agapus paludosus, Claviger testaceus, Dinothenarus pubescens, and Panageus cruxmajor. Their current populations in the area are not known.

Fiskarsinmäki hill, the herb-rich forest and meadow area of 22 ha in the northern part of the area, and some of the coastal reed area, have been placed under protection by decree. The area is called the Espoonlahti conservation area. A little section of this was included in the national herb-rich forest conservation programme. The designation of the Espoonlahti water area follows the national conservation programme for bird wetlands. Here the protective measures for the Natura site have been
taken under the Water Act and/or Nature Conservation Act. Water Act is applied to measures taken in the area requiring permission from the Water Court. The proposed protection of the *Macroplea pubipennis* population in the Saunalahti area is not included in the programmes. The reeds and water ought to be preserved in their natural state, and disturbances such as motor boats should not be permitted. The coastal meadow must remain open in order to preserve its microclimate. The protective measures consist of either establishing a conservation area under the Nature Conservation Act, or designing conservation solutions in the town plan.

**Matalajärvi**

Matalajärvi lies in the north of Espoo, east of Lake Bodom. As the name (‘shallow lake’) suggests, the lake is very shallow, the biggest depth being only a little more than a metre even in the open water areas. Matalajärvi is one of the few natural eutrophic lakes that have remained representative in vegetation and flora, and in a relatively natural state. The water vegetation and flora is very representative and demanding. There are occurrences of submerged plants such as the naiad species *Najas tenuissima* of the Habitats Directive, classified as nationally vulnerable, and the Shetland pondweed *Potamogeton rutilus*, classified nationally as near-threatened and rare. The populations of both were listed as those of least concern in August 2000. Further species in the diversity of submerged plants are the autumnal water-starwort *Callitriché hermaphrodita*, rigid hornwort *Ceratophyllum demersum*, the whorled water-milfoil *Myriophyllum verticillatum*, the small pondweed *Potamogeton berchtoldii*, the greater duckweed *Spirodela polyrhiza*, and the moss *Drepanogladus tenuinervis*. Representatives of the demanding lemnid and nympheid species on the lake are the ivy-leaved duckweed *Lemna trisulca*, the frogbit *Hydrocharis morsus-ranae*, and the least water-lily *Nuphar pumila*. The helophyte vegetation of the lake is rich and diverse as well. The hazel grove on the neck of Lake Bodom is a representative of the mesic, mesotrophic herb-rich forest (*Oxalis acetosella-Maianthemum bifolium* type) and the eutrophic herb-rich forest (*Hepatica nobilis-Oxalis acetosella* type). There are rich populations of herb-rich forest vegetation such as the fly honeysuckle *Lonicera xylosteum*, guelder rose *Viburnum opulus*, mountain currant *Ribes alpinum*, herb Paris *Paris quadrifolia*, and liverleaf *Hepatica nobilis*. Hazels of more than two metres dominate the bush stratum of the area. The prevalent trees in the grove are big spruces, often accompanied by big aspens, birches, goat willow and rowan. The eastern part of the forest can also show up some oaks. The lakeside forests of Matalajärvi, representative of deciduous swamp woods, are in their natural state in places. The common alder is the main tree there, but there are also downy birches among them. The deciduous swamp wood vegetation shows some mosaic created by the variations between the tussocks and the spaces between them. Dominant species of the ground stratum on the deciduous swamp woods are bog arum *Calla palustris*, bogbean *Menyanthes trifoliata*, yellow loosestrife *Lysimachia vulgaris*, marsh marigold *Caltha palustris* and gipsywort *Lycopus europaeus*. Bittersweet *Solanum dulcamara* and yellow iris *Iris pseudacorus* are also found in places. Matalajärvi is classified as nationally significant in the bird wetland conservation programme. The nesting birdlife has lost some of its diversity in the last few decades, but there is still a variety of water and shore birds on the lake. The nesting species regularly include species of Annex I in the Birds Directive such as spotted crake, crane, red-backed shrike, and ortolan bunting. An osprey pair nesting on Lake Bodom regularly prey on Matalajärvi as well. In addition, the nesting populations in the coastal forests include the endangered lesser spotted woodpecker. Matalajärvi has become more important as a migration resting point in the last few years. A number of water birds and waders rest on the lake. Species such as the red-throated diver, the arctic diver, whooper swan and smew are regular visitors. Some autumns there have been several dozens of smew gathering on the lake. Bluetroats are regularly spotted in the bushes along the lake, in the autumns in particular. Matalajärvi has been integrated into the national conservation programme for bird wetlands. According to the master plan for the northern parts of Espoo confirmed on June 17th 1996, the lake is an SL1 conservation area. The Natura site also includes the hazel grove at the neck of Bodom, not included in the reservations. The Natura site conservation is carried out on the basis of the Nature Conservation Act.

**Bånberget primeval woods**
The Bånberget primeval woods is in the north of Espoo, north-east of Lake Bodom. The height variation range is large. The vegetation areas vary from dry rock-slab pine forest (Calluna vulgaris type) to hillsides with young spruce forest of bilberry type, and stream valleys with lush herb-rich forests and spruce swamps. The variation in the nutritional quality of the soil from barren to rich offers good conditions for a diversity of living organisms. The Bånberget primeval woods represent Western Taiga almost entirely. Most of it is excellent primeval spruce wood, but the tops of the rocks also grow pine wood with shield bark, and aspen in places on the west of the hillside and in stream valleys. There is also a reasonable amount of rotten wood in the area.

The vegetation is very varied. Along the streams and on the hillsides it is rich with herb-rich forest species such as buneberry Actaea spicata, wood anemone and hazel. The main species of swamp depressions are wood horsetail and ferns. The area has been reserved as a conservation area in the confirmed master plan (part I) for the northern parts of Espoo. The area will be established as a conservation area as per Nature Conservation Act.

The network of green spaces in Espoo

The municipality of Espoo has an urban structure that consists of numerous centres of population located at nodes in the rail and road system, interleaved with a network of green spaces that includes parks, water areas and their surroundings, ecological corridors, cultural environments, roadsides, a system of footpaths and cycle tracks, outdoor recreation routes etc. This reticulate pattern means that there are green spaces of different kinds and with different uses located in the vicinity of all the centres and residential areas. Espoo has a rich variety of landscapes and natural environments, varying from uninhabited forests to remote islands and from agricultural landscapes to major urban centres. Looked at on a European scale, it is rare for nature to be so close to so many urban dwellers as it is here.

The principal elements in Espoo’s network of green areas, Nuuksio, the central park and islands, the Leppävaara parkland belt, the Espoonjoki Valley, the Gumböle-Mankinjoki Valley, the Suomenoja Valley and the Gräsanoja Valley, serve in effect to link together a multitude of scattered green areas of various kinds. The southern part of the district gains its distinctive character from the sea coast and the abundance of islands, while the central part is marked by its cultural landscapes, with broad areas of arable land and historic buildings, and the northern part is closer to nature in the sense of having a higher incidence of forests and lakes. Espoo has more than 100 lakes of various sizes, the majority of which are located in the Nuuksio area.

The highest proportions of the valuable areas of natural scenery in Espoo are occupied by mires and forests, with the fresh herb-rich forests particularly outstanding, but there are also valleys of small streams, bays of the sea, lakes and bare offshore skerries. About a half of the surface area of the municipality of Espoo is forest, which is a lot by the standards of the Helsinki conurbation, and there are also extensive water areas that attract wildfowl, including the wetland areas of Espoonlahti, Matalahti and Laajalalhti, which are all classified as nationally valuable and are included in the Natura 2000 network. Laajalalhti is also regarded as an internationally significant wildfowl habitat. There are about 2100 ha. of parks in Espoo that are owned by the City Council and recorded as such on the land use plans, together with a further approx. 1300 ha. of land recognised for planning purposes as green areas. It is possible that the City Council may acquire an additional 400 ha. or so of land for use as green spaces in the course of the next ten years. In addition to the above, constructed parks, children’s playgrounds and green verges beside roads account for a further 510 ha of green spaces and the yards and gardens around public buildings for another 210 ha. Nature parks, forests and meadows amount to an additional 268 ha.

Plants and animals in Espoo

The plants and animals to be found in Espoo fall into two categories: those that can tolerate human presence and even profit from the situation, and those that suffer from human presence. Species that thrive in urban surroundings include the racoon dog, certain birds such as the hooded crow, many plant
species, species that spread to the area during the war, and plants and animals typical of old cultural environments. On the other hand, the more demanding forest species are unable to find enough room in which to live in the fragmented forests of this area, and this is especially true of the species typical of old forests, which tend to avoid forest margins. There are many species that avoid human presence which have now retreated to the nature conservation areas, largely the Nuuksio National Park, but there are others that thrive on the kind of landscape mosaic that is found here, where there are enough patches of the right biotope to support them and the distances between consecutive patches are conveniently short.

**Threats to biodiversity and the structure of the network of green spaces**

Although about a half of Espoo’s surface area is forest, this area is dwindling fast on account of vast building schemes. The area was still densely forested in the latter half of the 18th century, but its forest area diminished rapidly in the 20th century and became highly fragmented. There are still some fairly extensive areas of uninterrupted forest in the north of the district, but only small patches remain in the south. Monitoring of the valuable nature conservation sites in the area has shown that less than a half of these have remained unchanged during the last fifty years, and the change may have been still more pronounced in the areas of less importance.

The population of Espoo began to increase markedly in the 1950’s, and the trend has been accelerating ever since. In the year 2000 the population grew by 3604 persons, i.e. 1.7%, about two thirds of this figure being attributable to natural increase (the excess of births over deaths) and one third to migration into the area. The main focus of new housing in the last five years has been the Leppävaara area, which is centrally located and has good transport connections and is therefore of considerable importance for the urban structure as a whole. Another area of rapid population growth has been the surroundings of the bay of Espoonlahti.

One notable threat to nature lies in the pressures on land use. On account of the rapid growth in population, new areas of land are being taken over for housing and commercial building and the areas remaining in a natural state are diminishing in size rapidly. Even the central park area is threatened by the encroachment of new building on its edges, and the sea shore is similarly threatened by new building that has already been planned, which will reduced the areas available for recreation purposes and the areas of natural shore environments. The increase in the density of building has also put pressure on the nesting and feeding areas available to the birds on the wetlands, especially where the former fields and grazed shore meadows have given way to housing plots and the margins of other building areas.

The construction process usually sets out with a change in the land use plan that enables land to be nibbled away from the edges of existing green areas for building purposes, but even nature conservation areas are not safe. It is difficult to perceive the changes taking place in the natural environment in this predominantly urban area, because they are often quite small ones and take place gradually. A line of telegraph poles is erected in one place and a new road is built in another, but the combined effects of these factors can be quite unexpected, and undesirable features are usually noticed only when it is too late to do much about them. The edges of the central park, for instance, should be protected under the general plan for the area, and greater weight should be attached to this plan in all matters concerned with green areas in Espoo.

Every effort should be made to keep the framework of the system of green areas sufficiently extensive that it can provide the main network of functional and ecological connections. Natural biodiversity should be ensured and adequate ecological corridors preserved throughout the Espoo area.

Efforts should be made to prevent excessive population pressures in advance, by means of rational land use planning. There should be more cooperation with planners, and an official statement of opinion should be obtained on the desirable number and extent of green areas and conservation areas, so that there should be no more nibbling away at the green areas, a process that will lead to their destruction if it is not arrested. The areas designated for protection should be given this status under the Nature Conservation Act or the Natura network, so that they should not be viewed as obstructing the progress of building, nor should it be possible to make alterations to the general plan where they are concerned.
The creation of conservation areas alone is not sufficient, however, for attention then has to be paid to their upkeep and management.

There should be a programme of measures at different planning levels for managing green areas and ecological corridors, and the use of the land set aside for transport purposes should be regulated in the general plan in order to fit in better with the green areas.

**Assessment of the impact of the Natura 2000 network in Espoo**

With a few exceptions such as the protection of the *Macrolea pubipennis*, the aim of the Natura programme is to protect environmental entities and broad areas. The delimitation of suitably large areas serves many purposes, and allows the Natura network to be exploited to increase general knowledge about nature and its value. Nuuksio is one of the most frequently visited of Finland’s national parks and is of immense value for recreational, educational and research purposes, and also to the small number of people engaged full-time in providing nature tourism services there, while another widely used Nature site in Espoo, Laajalahti, is frequented by groups from schools and children’s day centres in additional to individuals seeking recreation. It is possible to locate a wide variety of functions in Natura areas at the same time, in order to meet as many needs as possible, and this even applies to areas protected under the Nature Conservation Act. It is essential, of course, to avoid excessive trampling or other pressure on the natural environment, which implies in the case of nature tourism that visitors should be directed along carefully marked routes. Between 50 per cent and 80 per cent of all movement in the Nuuksio National Park, for instance, makes use of such routes. In order to ensure a sufficiently diverse network of green spaces, it is essential to set up parks and other more artificially constructed examples of natural environments in urban areas as well. In any case, the Natura areas, being by definition largely in a natural state, cannot be expected to suffice alone to provide potential users with a diverse network of green spaces.
Public opinion in Espoo

The Natura 2000 project was well received in Espoo, in spite of the predicted increase in urban planning bureaucracy, in that environmental impact assessments would be required more often, for example, and the protection regulations would impose boundary conditions on urban planning. There was also some criticism of the preparation phase, in which the City Council was obliged to intervene, and similarly of the financing arrangements, in that the EU was not prepared to contribute to the protection of the Macroplea pubipennis even though it was thought at that time to occur only in Finland.
The Role and Importance of Green Space for the Citizens of a Natura 2000 City: Venice

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Introduction

The focus of this report is on the relevance of green space for Venice, in the form of trees, gardens and parks, while bearing in mind that the cradle of Venice is its lagoon. To discuss green space in Venice means first of all to talk about the enchanting beauty surrounding this treasure.

Environment of the Lagoon of Venice

The Venice lagoon covers an area of 550 square km at the northern most end of the Adriatic Sea, a branch of the Mediterranean Sea.

It is the vastest Mediterranean lagoon (MIDWET); a natural area with an immense biological, faunistic and botanic variety (some animals and plants living in the lagoon are very rare and threatened by extinction). Yet, its interest for the modern expert is also based on a number of other factors, namely the combined presence of almost every known competing use of a coastal area: agricultural run-off from a drainage basin of 1,830 square km, industrial emissions and accidental spills from the largest concentration of chemical plants in Italy, a major port, an oil terminal, aquaculture, fisheries and shellfish cultivation and gathering, inside a wetland declared of international importance by the Ramsar Convention (of which only a small part is officially designated as a protected area).

Only in April 2000 did a ministerial decree identify the sites of Community interest and special protection zones under the EEC 92/43 Directive on Habitats and the EEC 79/409 Directive on Birds. These areas cover more than half of the Venice lagoon’s open water and mudflats, the home in winter to over 100,000 migratory birds.

Venice and its lagoon have threats from several areas: sinking, pollution, high tides, the risk of industrial and shipping accidents and general conflicting uses of the limited space.

Sinking has been halted as the pumping of groundwater and natural gas from the area was prohibited. Pollution remains a major threat. The old city has no sewerage treatment plant, and industrial and agricultural effluents still reach the lagoon. A plan to collect and treat these effluents has been developed Veneto Region, but it will take thirteen years to build at a cost of up to €200 million.

However, a key decision on the disposal of the treated water (inside the lagoon into the Brenta, a nearby river; or through a 20 km long marine outfall) has still not been reached.

The flooding of parts of the city at high tide is the most visible natural impact which many tourists have witnessed. A few centimetres spell the difference between a curious phenomenon and a serious problem.

When the tide reaches +100cm over the mean sea level, 6.5 per cent of the city surface disappears. With a tide of +120cm, the percentage jumps to 31 per cent, and at +140cm 90 percent of the city surface is under water.

For the last thirty years a consortium of Italian firms has been studying the best method of preventing exceptionally high tides from entering the lagoon, while keeping the appearance of the lagoon intact (the lagoon and the city of Venice are on UNESCO’s World Heritage list) and would unduly interfering with shipping.
The design for mobile high water protection barriers at the lagoon inlets has been developed in parallel to the Venice Water Authority - Consorzio Venezia Nuova General Plan of Interventions for the physical and environmental safeguarding of Venice and its lagoon.

The proposed solution is a series of 79 caissons, 20x30x5 meters in size and hinged on the bottom, capable of swinging to an upright position in order to seal the three openings of the lagoon to the Adriatic Sea, for a total length of 1800 meters.

Cost and environmental considerations have long divided the local community on the advisability of this solution, which in any case addresses only one of the environmental issues affecting the Venice lagoon.

On December 6, 2001, the Committee for Policy, Coordination and Control (known as the "Comitatone") unanimously approved the go-ahead for completion of the mobile barriers (Mo.S.E.) to protect Venice and the lagoon from the problems caused by the most frequent high waters and the risk of more dangerous events. At the same time, design of the complementary measures called for by the resolution of March 2001 enabling tidal levels in the lagoon to be attenuated should continue. These, in brief, were the decisions reached by the Committee set up by Law no. 798/84 for policy, coordination and control of activities to safeguard Venice and the lagoon (Comitatone), consisting of representatives of the competent national and international authorities and institutions and chaired by the President of the Council of Ministers, during its meeting of 6 December 2001 at Palazzo Chigi.

The "Comitatone" also expressed its opinion on the results of this further design phase. During the months leading up to the meeting of the Comitatone, further studies had, in fact, been carried out taking account of the predicted rise in sea level during the next hundred years. These additional studies have resulted in a proposal for complementary measures at the lagoon inlets to increase friction along the inlet channels to attenuate the most frequent tidal levels and adaptation of the design for the mobile barriers to these measures. The complementary measures consist in raising and protecting certain sections of the bed in the inlet channels and constructing sea side breakwaters to the south of the inlets. These elements enable tidal levels in Venice to be reduced by an average of 4cm. The combined effect of these 4cm, together with local measures to protect towns and villages to a level of +110cm and above, will reduce the number of closures per year. At present, the number would be reduced from 12 closures including false alarms (already representing an extremely modest impact on the lagoon environment) to an average of 3/5 closures per year. This could become even more significant should the predicted rise in sea level actually occur. The proposed morphological measures at the inlets are complementary to the mobile barriers, precisely for the design's characteristics of flexibility. They improve its effectiveness and extend its useful life.

The lagoon, as all low-lying coastal areas in the world, faces the additional uncertainties of global warming and the resulting sea level rise.

As well as the city of Venice, various islands with important testimonies of unique civilisations are enclosed in the lagoon.

The lagoon has been individuated as a possible Natural Park of national and international importance.

Despite of its extended urban and industrial areas, the lagoon's basin still reserves space for natural environments. The lagoon's landscape is characterised by wide sheets of water passed through by navigable canals and spangled with a myriad of argillaceous islands. Many of these form Venice and the minor centres, but others which were once inhabited and seats of important and essential activities are now completely abandoned. Flat islets scarcely emerging from the water form the "barene" and are furrowed by a thick network of little, winding canals called "ghebi". Between the barene and the wide sheets of water which form the living lagoon (laguna viva) we find submerged soundings, the "velme" which emerge only during very low tides.
This characteristic and fascinating landscape is still relatively well conserved in the northern lagoon while it has generally disappeared in the southern lagoon as a consequence of erosion caused by the deep and rectilinear "canale dei petroli".

The tide regulates the hydraulic exchange of waters and the biological and ecosystemic functionality of this humid area. For six hours the water level drops and it passes through the port's mouths and for six hours the water rises entering from the sea vivifying the environment and renewing it's vital cycles.

The lagoon is separated from the Adriatic Sea by a coastal band which presents three openings in correspondence with the ports of Chioggia, Malamocco and Lido. Towards the hinterland the bank of delimitation of the lagoon ideated by the Venetian Republic separates the delimitating band and the fluvial systems which once entered the lagoon from the lagoon's basin and from the embanked "valli da pesca" where the breeding of fish is carried out extensively. Once this band of transition, besides the rivers, was rich with waters, marshes, woods and forests which have nowadays nearly completely disappeared and are reclaimed and cultivated. The Venetian hinterland has gradually assumed the monotone appearance of a cultivated plain, strewn with small and medium sized urban centres, streets and industrial areas.

The Evolution of the Lagoon

The lagoon's basin, situated between the plain and the Adriatic Sea is an environment in continuous evolution which, due to the sedimentation of rivers or to erosion, has transformed itself into emerged surfaces or coastal areas. Roman origins of the first human installations in the lagoon, maybe also Paleovenetian and Etruscan, are emerging through archeological and scientific research. From then on the lagoon has been an object of important anthropic interventions for instance the erection of some centres on the emerged isles of the lagoon (Rivoalto, Torcello) and on the littoral (Metamauco).

Since the first settlements, water and city have maintained an inseparable symbiosis in Venice, and man has always tried to adapt the lagoon to his own needs. One has only to think of the 'Canal Grande', the main waterway of Venice, where we can find the most beautiful "palazzi" and which seems to be, with it's two sinuous loops, the historical trace of the river Medoacus, the ancient Brenta, which flowed into the lagoon during the Roman epoch.

From the origins of Venice until the 15th century, anthropological interventions were limited to works of consolidation, embanking and modest excavations to favour natural processes without modifying the geography.

Over the following centuries, important works of diverting the rivers to protect the port's mouths and the reclamation of marshland of the basin as well as the stabilisation of the lagoon's margins by embankment have deeply changed the morphological order. The deflection of rivers and the digging of deep canals to the sea have also modified the salinity.

However, until about the fall of the 'Serenissima' at the end of the 18th century, man sustained a natural equilibrium, mostly thanks to continuous interventions which never irreversibly damaged the stability of the system. During this century the equilibrium has been decidedly altered and has been broken for good with the effect of compromising both character and functionality of this fragile and unique environment.

The vegetation in the lagoon's area depends not only on climatic conditions and the nature of the soil but is strictly conditioned by the quantity and quality of water. Several vegetation types can be distinguished:

- a vegetation of dry environments typical of the sandy littorals between sea and lagoon;
- a salt-loving vegetation which is typical of the lagoon;
- a vegetation typical of the "barene" which are subject only to partial submersion;
- a water-loving vegetation typical in concentrations of fresh water;
- a vegetation made up of bushes and trees, mostly artificial.

There is a great diversity not only in the flora but also in the fauna; especially fish birds. Ornithological records denote the thousands of species of waterbirds that crowd the lagoon during the cold winter days, especially in the ‘valli da pesca’, leaving the area to others during the seasonal migrations and finally leaving the basin to the nesting species.

**Emergencies for the Environment of the Lagoon of Venice**

Today the lagoon's environment is no longer in equilibrium and the causes and conditions of degradation by far exceed the capacity of regeneration of the ecosystem. The principal points may be summarised as follows:

- The implementation of rectilinear dikes at the port's mouths, with the deepening of the soundings and the lagoon's canals, in particular at the port mouth of Lido and above all the notorious canale dei petroli at the port mouth of Malamocco. This canal, which was dug until 1968, has determined a faster propagation of the tides in the lagoon and has created hydraulic and morphological ruin resulting in the transformation of the lagoon into an arm of the sea, thus changing the character of the southern lagoon and swallowing up important remains of ancient installations.

- The reclamation of the "barene" caused by the expansion of Porto Marghera's industrial area including a large pool of polluting chemical and oil refining industries.

- The uncontrolled pollution of the draining basin, a hydraulic basin which is today subject to neglect.

- The excessive urbanisation of the lagoon's hinterland, the isles and the littorals.

- The growing intensification of the agricultural environment and the rivers which are connected to the lagoon's basin.

All of this still contributes in undermining the delicate equilibrium in which Venice and her lagoon continue to exist. "Venice is dying" is a recurring phrase and in effect the connection between Venice, the water and the lagoon's environment, upon which the city has built up her own history, her traditions and her civilisation, is in crisis.

Venice's problems cannot be reduced to the showy effects of the high tides which are divulged by the mass media. Venice was born in the water and will continue to live in the midst of water and it is this millenary connection which makes her a unique and marvellous city.
It would be naïve to think that all problems can be resolved and that an unreal economic development would be possible after succeeding in ‘rescuing’ Venice from the high tides.

In fact Venice’s problems are largely due to the movements of the inhabitants and the continuous waves caused by the multitude of motor boats. They cause great destruction in the lagoon’s basin, corroding the fragile structures of the environment and of the buildings of this unique city and requiring continuous urban upkeep.

The Lagoon’s Potentialities

In spite of all these difficulties, Venice persists in being a city in the waters and therefore of being outside of all functional and structural schemes of a normal town. In the urban, social and economic sphere Venice contains the potential to become a city of the future where man and environment might be reconciled within the ambit of sustainable economic development. The lagoon, a suggestive environment which is also rich with human and natural resources, might inspire an alternative way of administering the territory.

Firstly, all productive activities that are compatible with sustainable development should be conserved or developed. In ports areas there should be progressive reduction of petroleum and chemical traffic connected to the now-incompatible industries of Marghera. Instead, passenger traffic and coastal trade might be developed, which for a seafaring nation with broad coasts like Italy should be a new way of transportation.

Thought should be given to major shipyards like those of Pellestrina and Fincantieri at Marghera and to minor shipyards for wooden boats, in particular the rowing and sailing boats which are traditionally used for transportation within the lagoon.

There are opportunities involve with the Laboratory of Research of New Maritime Technologies which have been realised in part by the society Thetys with seats at the ‘Arsenale’. The Arsenale which might become a centre for other enterprises in the Venetian area and which must have a future.

But the greatest opportunities are bound to the two major environmental issues with which the future and the safeguard of Venice and her lagoon is connected: Porto Marghera and the Park of the Venetian Lagoon.

The purifying of Porto Marghera and the reversal of the greater part of damaging industrial activities represents a possibility for investment, occupation and development, that is sustainable for the whole lagoon as well as Venice. This might develop Venice as a place to attract new ideas, entrepreneurial projects, science and advanced technology, at least at regional level.

The institution of the Park of the Venetian Lagoon, which is observed with scepticism by entrepreneurs (in particular those in the tourism sector) and by hunters, must be a model which might combine environmental protection with a compatible development of the lagoon’s basin.

Without this essential instrument and without a regulation of economic activities which take place in the lagoon, there is the risk that the immense natural heritage of the Venetian lagoon might be squandered within a short time.

The sustainable development of the Venice lagoon is not a purely technical problem. The participation of the local population is a key element and the instruments for it are still too new (Local Agenda 21, for example). The Forum has proposed that a special administrative status be assigned to the entire lagoon with an Authority having over-riding management powers over it. However, there are no precedents in Italy of such an arrangement, and the legislation concerning national parks is not applicable to an area in which productive activities are so prevalent.
The lagoon, with its deserted islands and sand banks, is at once a natural paradise, a desert waiting to be explored, an archeological find, and a textbook on flora and fauna. The European Union, in an effort to safeguard as well as utilise this Venetian jewel, has implemented 'Vivilaguna'; a set of four guided tours through nature, archeological ruins, fields and fish. Transport is by motorised barges or "bragozzi", the beautiful boats typically used by the fishermen of Chioggia.

Last year, the RiViNatura cooperative was started with the collaboration of Forum for the lagoon (www.forumlagunavenezia.org), a cultural association with a decennial experience on the topics of the environment safeguard and sustainable development.

RiViNatura is a company made up of proponents of Venice and its Lagoon, ecotourism professionals, sailors and fishermen who draw from their personal experiences on the Lagoon transmitting the richness of the natural and cultural system to their guests. Sailing on beautiful boats, the visitors receive a more comprehensive and real experience than the typical tourist.

Other Venetian Life projects:

The LIFE-Salt Marshes Project: (1999-2002)

- studied marshes in the Lagoon of Venice (Italy) and in the section of the Wadden Sea (Lower Saxony, Germany).

- used ecological engineering techniques to protect and restore salt marshes in the Lagoon of Venice.
  (for details, please see http://www.tu-berlin.de/fb7/barene/english/sites_en/0_overview/)

These techniques have been used for years to restore freshwater ecosystems - the Project represented one of the first applications for salt water ecosystems, and its results will be useful for the Wadden Sea, and possibly for other European sites.

Four main partner organisations carried out the LIFE-Salt Marshes Project.: Magistrato alle Acque (Venice Water Authority), City of Venice, Coastal Research Centre, Lower Saxony Ministry for Environment, Technical University of Berlin.


Realisation of a monitoring system of the environmental conditions of aquatic coastal ecosystems; definition of strategies of management of the ecosystem of the use of its renewal and of methods and intervention procedures of participation with administration of the territory Services and civil Protection.


Newcastle City Council (partners: Birmingham, L’Aia, Lipsia, Malmo, Newcastle, Nottingham, Tampere, Venice, Vienna)

Elaboration of the methodology of the "peer review", developed by the OECD (Organisation for Economic Cooperation and Development) as instrument to encourage the sustainable development in the European cities. Realisation of specific determined time programmes to improve the efficiency of the urban sustainable development policies in the cities.

Biodiversity in Dublin City Urban Parklands

D. E. Lynn, N. E. Kingston, J. R. Martin & S. Waldren,
Abstract

Biodiversity was measured for five regional and fifteen neighbourhood urban parklands in the south-west Dublin city area, including a recently developed municipal golf course. Plant species were inventoried by habitat type in the spring, summer and autumn. Birds, mammals and fish were also recorded for each park with substantial input from environmental groups and members of the local community.

The parklands varied in size, management and origin. Habitat diversity and area were found to be the most important factors affecting biodiversity. Parks that originated as old demesnes or as agricultural land tended to have a relatively higher diversity compared to the open green spaces set aside following urban development. Encouragingly, recently developed parks have been designed to enhance wildlife by maximising the number of habitat types such as the development of water features and the retention of old hedgerows.

The ecological assets of each park were described and specific management recommendations to enhance biodiversity were provided, such as set aside areas of wildflower or hay meadows and the planting of native woodland species. Rare species and areas of conservation interest were highlighted and mapped.

The information has been used by the local authority for management direction and educational purposes. The surveys also provide a baseline data-set which will allow monitoring of future change; this is particularly important for the most recently developed parklands and for the municipal golf course which has signed up to the European Committed to Green programme.

Introduction

South Dublin County Council services 240,000 people in the south-west of Dublin City. The area has over 1,400 hectares of green space with 5 regional parklands, 25 neighbourhood parks and a municipal golf course. South County Dublin’s urban parkways are an important amenity resource for the local communities but also provide habitats for many native Irish species of flora and fauna in an otherwise altered landscape. The history of the parks varies enormously, with some developed from old estates or agricultural land and others constructed as green areas between suburban townlands. They also vary in size and management with many areas intensively used for amenity purposes while others are less well managed or abandoned.

This survey was commissioned in 1999 by the South Dublin County Council Parks Department in order to survey and compile a comprehensive inventory of the flora and fauna and a detailed map of the wildlife habitats in selected parks. The aim of this survey was to provide the necessary baseline information for a database on the flora and fauna of the parklands, which would be an important educational resource that could be used to inform people on the biodiversity present within the parks. The information provided in the survey would also aid the long term planning and management of these parklands. Finally it would also provide the knowledge to safeguard against detrimental changes in sensitive ecosystems and individuals or populations of rare species.
Summary of the Aims of the project

- Compile an inventory of the flora, fauna and habitat types for each of the regional parks
- Describe the ecological assets of each of the parks i.e. flora, fauna, rare/protected species and habitats
- Specify management recommendations required to conserve certain species and habitats
- Identify priority areas for nature conservation on a site map for use in site planning.
- Highlight the potential value of the regional parks for environmental education
- Compare and contrast the levels of biodiversity in the parklands

Methods

The parks surveyed are listed in Table 1. The parks were visited during the spring, summer and autumn to account for any potential seasonal variation. Local staff and community groups from each of the parks were consulted about their observations and knowledge of the parks in their care.

Table 1: List of parks surveyed

<table>
<thead>
<tr>
<th>Name</th>
<th>Park type</th>
<th>Area (ha)</th>
<th>Name</th>
<th>Park type</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corkagh</td>
<td>Regional</td>
<td>117</td>
<td>Tymon</td>
<td>Regional</td>
<td>130</td>
</tr>
<tr>
<td>Leixlip</td>
<td>Regional</td>
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<td>Stewarts</td>
<td>Regional</td>
<td>52.7</td>
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<td>Griffeen</td>
<td>Regional</td>
<td>49</td>
<td>Waterstown</td>
<td>Regional</td>
<td>65.7</td>
</tr>
<tr>
<td>Dodder</td>
<td>Regional</td>
<td>85</td>
<td>Fettercairn</td>
<td>Neighbourhood</td>
<td>19.4</td>
</tr>
<tr>
<td>Jobstown</td>
<td>Neighbourhood</td>
<td>15.4</td>
<td>St. Cuthberts</td>
<td>Neighbourhood</td>
<td>16.2</td>
</tr>
<tr>
<td>Killinarden</td>
<td>Neighbourhood</td>
<td>19.4</td>
<td>Elkwood</td>
<td>Neighbourhood</td>
<td>9.3</td>
</tr>
<tr>
<td>Collinstown</td>
<td>Neighbourhood</td>
<td>18.8</td>
<td>Glenaulin</td>
<td>Neighbourhood</td>
<td>11.2</td>
</tr>
<tr>
<td>Hermitage</td>
<td>Neighbourhood</td>
<td>9.3</td>
<td>Ballymount</td>
<td>Neighbourhood</td>
<td>22.7</td>
</tr>
<tr>
<td>Sean Walsh</td>
<td>Neighbourhood</td>
<td>36.4</td>
<td>Rathcoole</td>
<td>Neighbourhood</td>
<td>14.2</td>
</tr>
<tr>
<td>Willisbrook</td>
<td>Neighbourhood</td>
<td>6.8</td>
<td>Rathfarnham</td>
<td>Neighbourhood</td>
<td>7.1</td>
</tr>
<tr>
<td>Grange Castle</td>
<td>Golf</td>
<td>62.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Field Study

The parks were divided into the six broad habitat types listed below, defined by a combination of the dominant plants of the habitat and the local terrain.

- **Grassland** - Grass species are dominant and the habitat is maintained by regular cutting.

- **Woodland** – Tree species such as oak, beech, alder, ash or conifers are dominant. Recent plantings in the regional parks consisting of large numbers of willow, birch or poplar were also all classed as woodland for this study.

- **Waterside/Riverside** – This habitat included all species growing in the immediate vicinity of an aquatic habitat. The aquatic habitat itself, which sometimes contained submerged or floating plants was also included within this broad habitat type.

- **Hedgerow** – A generally well established artificial habitat consisting of linear arrangements of dominant shrub species with some tree species featuring.
- **Scrubland** – A more open habitat than woodland where shrubs such as hawthorn, blackthorn and gorse are a significant feature but many grassland species remain in more open areas.

- **Ruderal (Waste)** - Areas dominated by pioneer plants, many of which are annual species. The habitat is generally open with many bare patches of soil.

Species associated with any unusual feature or area within the parks were classified separately.

Dubious identifications were collected and confirmed with the use of detailed keys and herbarium specimens. These included bryophytes, lichens and fungi, which are difficult to identify in the field.

For the purposes of this study native species are defined as species which are indigenous to Ireland and for which there is no evidence that they arrived as a result of human activity. Alien species are species which are definitely known to have been introduced as a result of human activity, and have become well established in the wild.


Habitat maps for each site were sketched in the field and compiled on PC computer using ArcView®.

**Assessment of rare and protected species**

To assess which species are rare and protected, all species recorded during this survey were cross referenced against the two Irish red data books that have been published to date. These two texts are *The Irish Red Data Book: 1 Vascular Plants* (Curtis & McGough, 1988) and *The Irish Red Data Book: 2 Vertebrates* (Whilde, 1993). No red data books have been published for invertebrates, fungi, or bryophytes, although a list of bryophytes was included in the most recent Flora Protection Order (1999).

**Assessment of biodiversity**

Biodiversity was calculated for each of the parks by calculating the number of species found in the park divided by the logarithm of the area of the park (the actual area of the park cannot be used as there is not a linear relationship between the size of an area and the number of species that occupy it). All recent data on the parks collected during the field study and also from other studies were used when calculating the total biodiversity for each of the parks.

**Comparison of biodiversity**

Summary data for each of the parks was calculated and tabulated (Table 2). Summary data included area, biodiversity, habitat number, number of native species, total species number and number of protected species.
Table 2: Summary data for each of the parklands surveyed

<table>
<thead>
<tr>
<th>Park</th>
<th>Total sp.</th>
<th>Native sp.</th>
<th>Total biodiv.</th>
<th>Native biodiv.</th>
<th>Habitat no.</th>
<th>Protected sp. no.</th>
</tr>
</thead>
<tbody>
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<td>Dodder</td>
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<td>359</td>
<td>262.26</td>
<td>186.07</td>
<td>6</td>
<td>8</td>
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<tr>
<td>Waterstown</td>
<td>438</td>
<td>315</td>
<td>241.00</td>
<td>173.31</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Rathfarnham</td>
<td>181</td>
<td>121</td>
<td>212.63</td>
<td>142.14</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Griffeen</td>
<td>357</td>
<td>243</td>
<td>211.22</td>
<td>143.77</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Stewarts</td>
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<td>224</td>
<td>194.00</td>
<td>130.10</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Leixlip</td>
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<td>206</td>
<td>177.00</td>
<td>136.13</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Tymon</td>
<td>373</td>
<td>271</td>
<td>176.45</td>
<td>128.20</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Willsbrook</td>
<td>139</td>
<td>109</td>
<td>166.97</td>
<td>130.93</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Corkagh</td>
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<td>243</td>
<td>160.04</td>
<td>117.49</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Rathcoole</td>
<td>168</td>
<td>131</td>
<td>145.80</td>
<td>113.69</td>
<td>5</td>
<td>1</td>
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<tr>
<td>Sean Walsh</td>
<td>227</td>
<td>175</td>
<td>145.41</td>
<td>112.10</td>
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<tr>
<td>Grange Castle</td>
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<td>179</td>
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<td>3</td>
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<tr>
<td>Ballymoun</td>
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<td>116</td>
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<td>85.54</td>
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<td>1</td>
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<tr>
<td>Hermitage</td>
<td>111</td>
<td>86</td>
<td>114.61</td>
<td>88.80</td>
<td>3</td>
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<tr>
<td>Glenaulin</td>
<td>115</td>
<td>93</td>
<td>109.61</td>
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<tr>
<td>Collinstown</td>
<td>136</td>
<td>98</td>
<td>106.74</td>
<td>76.91</td>
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<tr>
<td>Elkwood</td>
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<td>96.03</td>
<td>66.08</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Killinarde</td>
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<td>91</td>
<td>91.63</td>
<td>70.66</td>
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<tr>
<td>St. Cuthberts</td>
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<td>85</td>
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<tr>
<td>Jobstown</td>
<td>78</td>
<td>64</td>
<td>65.68</td>
<td>53.89</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Fettercairn</td>
<td>77</td>
<td>64</td>
<td>59.79</td>
<td>49.70</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Detrended correspondence analysis (DCA) was then carried out to spatially visualise the parks in relation to one another, based on the species composition. DCA is a multivariate analysis technique that measures association (or similarity) between sites, and allow study of spatial patterns in vegetation. The resulting ordination views the distribution of plant species as series of continua along environmental gradients, with frequently-associated species close together, and dissimilar species apart. Thus, similar sites ordinate close together, while dissimilar sites are far apart. The importance of an ordination axis in explaining the total variation within a data set is reflected in the ‘eigenvalue.’

Data matrices were compiled in MS Excel and analyses carried out using PC-ORD for windows (McCune & Mefford, 1997).
Results

Habitat maps for selected representative parks have been chosen to illustrate the range of habitats types and to highlight particular features present in the different parklands.

Editor's Note: Due to space constraints, the maps for most of these sections have been omitted, but all are available from the authors.

Dodder Valley Linear Park

Figure 1: Dodder Valley Linear Park

[map of park here]

The dominant feature of this park is the River Dodder. Along a significant proportion of its length the river is shaded by a narrow section of tree cover as associated pathways that is an important component of the waterside habitat in the park. Almost all of this tree cover appears to be the result of natural colonisation and the vulnerable vascular plant species *Scrophularia umbrosa* occupies a niche within this habitat.

Many of the hedges in the park are found along the borders of the fields either side of the River Dodder. The grassland habitat of most interest is in the area of the ruined site near the designated Natural Heritage Area (NHA). This area contains many habitats including waste areas, grassland and scrub, depending at what stage in the succession the vegetation is at. The fact that a succession of habitats can be viewed in the one area makes this section of the Dodder Valley quite interesting as an educational resource. The final habitat of note is the dry open scrub areas that are found along certain sections of the river and are dominated by Gorse (*Ulex gallii*) and characterised by gravel bank species such as Yellow-wort (*Blackstonia perfoliata*) and Marjoram (*Origanum vulgare*).

The most important area of woodland in the park is the area of wet Alder (*Alnus glutinosa*) and *Salix* dominated woodland within the designated NHA. Several habitat types are present within the NHA, which is mostly a low-lying seasonally flooded area providing a habitat for the Common Frog (*Rana temporaria*) and is the only location in the five parks where the Smooth Newt (*Triturus vulgaris*) has been observed. Willow (*Salix* sp.) and alder (*Alnus glutinosa*) dominate the flooded areas and the ground cover consists of a mixture species tolerant of wet conditions. Extensive gravel banks allow the colonisation of ruderal species during bouts of dry weather and areas of gorse scrub provide nesting sites for small birds.

Tymon Park

Tymon Park has a diverse range of habitats. Large areas of the park are occupied by playing pitches, however between these pitches the hedges have been retained as a remnant of the park’s former use as agricultural land. Also the retention of Tymon Lane and the associated hedges adds to the rural landscape of the park. Some fields not used as pitches are managed as wild flower meadows and retain grassland species of interest such as the Pyramidal Orchid (*Anacamptis pyramidalis*). At present a substantial amount of the woodland in the park contains a high percentage of non-native species.

Several water features have been developed along the river Poddle, in particular the Tymon lakes. These provide a breeding ground for a diverse range of water-fowl. These lakes are planted with many non-native species and are maintained as a visual amenity for visitors to the park. The Limekiln lakes were recently developed as flood attenuation for the River Poddle, and have been planted with the Flowering Rush (*Butomus umbellatus*) amongst other species. The Wellington lakes were also developed more recently but have been colonised by native aquatic flowering species providing a habitat for amphibians (eg. *Rana temporaria* - the Common Frog) and aquatic waterside insect species (eg. *Enallagma cyathigerum* - the Common Blue Damselfly).
Griffeen Valley Park

The Griffeen Valley Park runs along the Griffeen River, with some smaller outlying park areas among housing developments to the west. The main area of the park is split by the Lucan By-Pass, with Vesey Park on one side and Griffeen Park on the other. The most important feature of the Griffeen Valley Park is the old woodland in Vesey Park that was retained when the park was formed. This woodland is most extensive along the Griffeen River and contains mature deciduous and coniferous trees. The most important area on the river is the wet woodland containing the most extensive fern and bryophyte growth recorded in the five parks surveyed. The woodland also provides the habitat for the protected species *Hypericum hirsutum*.

Waterstown Park

Waterstown Park is the largest area of park held by South Dublin County Council along the River Liffey. The park entrance is flanked by a diverse ruderal and waste area and an extensive scrub thicket. Several pathways lead around a highly diverse grassland which are fringed with mature hedgerows and also incorporate woodland plantations. A large area is the site of a now vegetated tip head. Further down towards the river lies a wet grassland which is being invaded by willow species. An old woodland borders a disused millrace which runs parallel to the river. This millrace supports a diverse aquatic community with colonies of the rare flowering rush, *Butomus umbellatus*. The park is secluded and is not visited extensively by the locals and there is also evidence of antisocial behaviour.

Grange Castle Municipal Golf Course

Grange Castle golf course was derived from tillage farmland and opened in 1998. The course is a full 18-hole course with the characteristic layout of tees, greens, fairways and rough areas, bordered by planted areas and hedgerows. The partition of grassland results in different levels of diversity that is associated with the intensity of the cutting regime. Artificial features such as sand bunkers, lake systems and tree plantations have been incorporated into the course. Old farmland hedges have been retained around most of the perimeter of the course and remnants of two lane-ways with intact hedge margins occur within the area. Several mature standing trees are scattered throughout the course.

Seán Walsh Park

Seán Walsh Park is a recently developed park in the middle of an urban centre. The dominant features of the park are the developed water features, which support a thriving bird community and have a high aesthetic and amenity value. Patches of woodland have been planted on the western side of the lakes and in parts include are more diverse than the typical birch/poplar plantation. In some areas these patches are diffuse enough to allow the establishment of a ground flora. A sizeable abandoned area has been colonised by a highly diverse ruderal community. This community may be less ephemeral than most ruderal communities due to the underlying rubble which is unlikely to support a more advanced community type. The seed produced by many of the ruderal species is harvested by finch species. A tributary of the Dodder runs along the edge of this area. An untended grassland occupied most of the western end of the park and has been colonised by more ruderal species in open patches. A dense hedge runs down the eastern side of the grassland and this area and the surrounding grassland was considerably damp and uneven.

Jobstown Park

Figure 2: Jobstown Park
Jobstown Park is dominated by open maintained grassland which support several playing pitches. A pruned hedge divides the park, and a few uprooted and abandoned flower beds were planted around the margins. There are no permanent or artificial water bodies in the park nor is there any habitat to provide suitable shelter for nesting birds or small mammals. It appears that any effort made to improve this park has been thwarted. Planted trees have been snapped, flowerbeds have been uprooted and part of the hedge system burned. The hedges have been pruned probably to reduce that amount of rubbish that has become trapped in the scrubby hawthorn. Evidence of dumping was observed throughout the park and rats were seen foraging through the litter.
Comparisons of biodiversity

Figure 3 shows a graph of the all parks surveyed and their associated biodiversity values. The regional parks largely fall at the top of the graph, with only the neighbourhood parks derived from estate lands falling among them. With the exception of Willsbrook Park all of the upper parks also have lake habitats. The more recently developed neighborhood parks (Seán Walsh, Rathcoole and Ballymount) score relatively highly as all these parks have been developed with artificial water features, and ruderal habitats feature prominently.

Biodiversity increases with increasing habitat number. There is no relationship between the number of protected species and habitat number, with most of the protected species occurring in the regional parks When all of the species from each of the parks are summarized using DCA (Figure 3), a split between the neighborhood and regional parks is evident along axis 1 of the resulting ordination, which accounts for most of the variation present within the data set. This means that the species assemblages for the regional and neighborhood parks are inherently different. The golf course lies between the two groupings. Spread along the y-axis is mainly between two of the regional parks. A closer look of the species present within these parks revealed a unique suite of aquatic plants in one and damp meadow species in the other.

Figure 3: Total and native biodiversity for each of the parklands surveyed. Black indicates regional parks, grey indicates neighbourhood parks and white indicates the golf course.
Discussion

Different levels of biodiversity were evident between the parkland types with regional parks generally higher, however parks developed from older estates also had a relatively high biodiversity index. The level of biodiversity was related to areas where communities have been allowed to establish with less intensive management, however abandoned or ephemeral areas can add considerably to the biodiversity. Rare species tended to be restricted to areas that are in proximity to natural features such as the river systems or mature woodland. Although it is recognised that the primary function of neighbourhood parks is to provide an amenity area for the local community, the parks surveyed displayed a range of levels of diversity that were related to the development of the individual park and the associated management regimes.

While an amenity green space is often considered to require manicured lawns, playing fields and aesthetic plant life there is a growing proportion of the community who appreciate a more natural setting with a rural feel, such as wildflower meadows. Some of the more recently established parks such have been thoughtfully developed so that high amenity and untended wildlife areas can co-exist within the same park. Unfortunately wildlife areas that are set aside tend to be secluded and often considered dangerous.

Management recommendations

General recommended management practice to enhance the biodiversity within the parklands are:

- The sensitive management of hedges and waterways that have been incorporated into the parks from the original landscape
- Grassland areas set aside and managed as traditional meadows, i.e., only cut biannually or annually will contribute greatly to the amount of diversity in the flora and fauna found in the parks.
- Tree planting schemes to increase native biodiversity, and when possible native Irish tree species from local indigenous seed should be used. Increasing the tree cover will also provide shelter and nesting areas for birds and small mammals.
- All lakes and streams should be kept unpolluted and suitable nesting areas for waterfowl secured. Litter bins should be plentiful and emptied on a regular basis.
- For amenity planting, a greater range of species should be included with more educational initiatives such as interesting cultivars or landraces and also species that will attract butterflies and moths.
- Where vandalism or loitering is a problem within the parks resident committees should be encouraged to monitor and protect their local green spaces and also be made aware of the wildlife present within these areas.

Detrimental management practices would include:

- the removal of hedges
- drainage of wet areas
- planting of native or non-native species that will disrupt the natural ecosystem
- inappropriate use of pesticides or herbicides
Education

In addition to conserving the diversity of species and habitats in the parks it is also important that educational material is developed to inform the general public. The Microsoft Access® database and detailed maps that have been produced as part of this survey are currently being used for the production of educational material in the form of nature walks, poster boards, leaflets and CD ROM. SDCC will be able to use the database to encourage local schools and interested groups to use the parks as an educational resource and where possible contribute information to the database, for example it is often quite difficult to comprehensively record the more elusive faunal communities during a set period of time, therefore local schools and ecology groups should be encouraged to visit their local parks and catalogue these insect communities at different times of the year.

In addition to the database being made available to the general public it should also be utilised for training programmes within SDCC. One possible training programme would be to make Park Rangers etc. aware of the species and habitats found in the parks and how best to manage them for the future. It is hoped that the simple calculations of biodiversity presented in this report can be used in the future to assess whether there has been any significant changes in overall biological diversity in the parks.

References


