Backyard biodiversity

Gilbert Brakey
Gecko NZ (Gecko Trust / Gecko Ltd)
PO Box 19386, Avondale, Auckland, New Zealand
gecko.trust@xtra.co.nz

ABSTRACT

Much of the urban area of New Zealand is in either public or private land ownership. Biodiversity outside the public conservation lands includes farms, Māori land, urban backyards, land managed by public utilities, and council reserves. Publicly owned land is comparatively well cared for when it comes to having a biodiversity strategy, but land in private ownership is a more neglected area. New Zealand today lacks a land ethic that encourages the protection of natural values on private land. Thus it requires a mind-shift to think of urban areas as an integral part of biodiversity management. Apart from the preliminary 'Bio-What?' report of 2000, and the follow up MfE report, Biodiversity on Private Land published in the same year, biodiversity on private land is an area very much in the process of construction.

Green open-spaces in private ownership are an integral part of a residential, commercial, industrial, and reserves urban mix. This mix comprises areas of bush, gardens, motorway / council reserves and grassed areas, which in their own right offer some degree of biodiversity. But are these places adequate long term, and do they offer a means of increasing our indigenous biodiversity and sustainability as a nation? What opportunities are there for increasing species diversity, of protecting gene diversity and increasing habitat through ecological diversity?

Ecologically based landscape planning and design may offer an opportunity through the introduction of the Bushways™ concept which would not only address peoples need for aesthetic appeal, but also addresses a national biodiversity strategy for land in private ownership. This creates a means by which individuals can meet their own needs and at the same time contribute to the community and a region — thus 'turning the tide' on the loss of indigenous biodiversity throughout the urban areas of New Zealand.

INTRODUCTION

Biodiversity on private land or 'Backyard Biodiversity' needs to involve all people within a community, enabling them to take on the responsibility for the protection and enrichment of indigenous biodiversity on private land, including their neighbourhood, be it urban, peri-urban or rural. There is a real need to develop a land ethic based upon a sense of guardianship or stewardship, a form of Māori kaitiakitanga (kai-tiaki-tanga). This is New Zealand's traditional guardianship of the land, intended to maintain a close spiritual bond with the natural world, which was integral to sustaining both the Māori people and their natural resources over succeeding generations. We could all learn from this land ethic.

The well-known American conservationist, Aldo Leopold, aptly comments on the subject of developing a land ethic within the community:

> '*The evolution of a land ethic is an intellectual as well as emotional process. Conservation is paved with good intentions, which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use. I think it is a truism that as the ethical frontier advances from the individual to the community, its intellectual content increases'*. Aldo Leopold (1949).

It is not a distant problem — what we do on our land does affect our neighbours. Neither

is it the sole responsibility of government agencies nor of territorial local authorities to address biodiversity issues. All sections of the community need to be part of the answer.

Urban biodiversity is at risk of being depleted and devalued due to ignorance of its significance as an integral part of our lives. Biodiversity will of course mean different things to different people and represents a complex concept in itself. This concept probably needs to be more *explained* than *defined* to the layperson.

DOES BIODIVERSITY MATTER?
So why should biodiversity be important to the wider community? After all, how reliant are we on biodiversity?

Our dependency upon biodiversity
Every day we depend on plants and animals in order to stay alive. An Australian, David Mussared has reflected how much dependence we have in an act as simple as eating our breakfast (Mussared, undated). Breakfast may well have started with bacon and eggs. Of course bacon is from pigs, and the farm fresh eggs on toast includes hens and cereal grain and yeast. In order to digest all of that, there are millions of micro-organisms at work in your digestive tract. The pigs and hens feed on plants. The plants grow in the soil, involving worms, fungi, nematodes, micro-crustaceans and a myriad of other soil life — biological diversity. So you haven't even finished all of your breakfast yet, and you are already into the thousands, maybe even the tens of thousands of organisms. Oh, and where does the oxygen come from for all this?

So the response to our need for biodiversity becomes a little more self-evident. We depend upon countless other species every moment of the day in order to stay alive, as they also depend upon us. We are part of the food web, like it or not.

Recent research by Professor Andrew Beattie (pers. comm. 2003) at the Macquarie University in Australia, estimated that at least 4620 different species of animals, birds, plants, insects, worms, spiders, micro-organisms and so forth were living in just one suburban backyard of Sydney.

You might say, 'that's Sydney' — but have you checked your own backyard recently for its biodiversity of life?

Suburban biodiversity richness
In New Zealand, estimates of suburban biodiversity richness has been conducted by Dr Guillermo Kuschel, in a small area of remnant bush in the Manukau Harbour suburban area of Wattle Bay, Lynfield Auckland (Kuschel 1990). At that site, some 753 endemic beetle species were recorded which normally would account for about one-quarter of the total insect fauna for such a site. That equates to something like an indigenous insect species population of around 3400. Then there are of course the numerous native birds and plant species. A rich biodiversity indeed, if we care to look deeply enough.

The question may be asked, 'Do we need all those species to exist; surely we can get by without some of them?'

Maybe we could survive with less species, or by using alternatives, and of course that is precisely what we tend to do. Humans have a predilection toward neglecting species, which at the time seem less desirable or dispensable, and sending them to extinction. Unfortunately, this is something that we are not exempt from in New Zealand. We are whittling away at the diversity of life every time we develop more infill housing and in a myriad of other ways. Some estimates state that we are losing some 10 000 species a year worldwide.

The problem is, does anyone really know the actual loss and the consequential flow-on effects?

Can we do without the 'nuts-and-bolts' of an ecosystem?
An analogy can be made with the Auckland Harbour Bridge, it works well as long as the engineers carry out constant maintenance checks and repairs to ensure all the nuts and bolts are in place. However, what happens if it starts to lose some of the bolts holding the steel beams together? The loss of one

or two may not be critical, as the bridge does not necessarily depend on them to hold it all together. But how many bolts would it need to lose before you might change your mind about using the bridge as a means of getting to the other side?

As New Zealanders, how much of our biodiversity are we prepared to lose before we act? The kiwi, our national icon, is in serious trouble from loss of habitat, as are numerous other species, animal and plant alike. In fact, many species are already extinct.

Can we do something about biodiversity in our own backyard?

Can we make a difference in our own backyards working at a 'grass-roots' level? I believe we can. Working on biodiversity issues at home, in the city, may seem remote from the saving of kiwi whose habitat is out there somewhere in some forest in the mountains. But all components of a living system are interconnected. Biodiversity is not something we can save in a zoo, but is instead a system of which we need to be part of, if we as humans want to survive, and if we seriously want a living environment that we can enjoy now and into the future. Our backyards are part of that living system. There are well over a million landholders in New Zealand and all can play a part in biodiversity conservation.

Animal life cannot exist without a suitable place to live, and plants cannot survive without suitable space in which to do so. They might hang on, but many will be lost forever and the rest will be of a limited range. Biodiversity depletion of ecosystems, species and genetic stock will be an inevitable result. Do our urban areas need to be part of a biodiversity depletion outcome? We do have a choice.

BIODIVERSITY ON PRIVATE LAND

When the Convention on Biological Diversity (CBD) came into force as an international agreement under the United Nations in 1992, New Zealand was quick to be part of the ratification of that agreement in 1993. However, it then took another seven years for the government to release its New Zealand Biodiversity Strategy (DOC & MfE 2000). As part of its commitment to the CBD accord, it has also investigated biodiversity on private land (Ministerial Advisory Committee 2000a), which followed the preliminary report, Bio-What? (Ministerial Advisory Committee 2000b).

The Chair for the Ministerial Advisory Committee, John Kneebone, was to say in his overview:

> *'As a landscape, and as a community of property owners, the New Zealand scene is one of extreme diversity. Each property differs from its neighbour, as does each incumbent owner. Characteristics may be shared, but there it ends. This complexity, when superimposed on districts with particular concentrations of biodiversity, produces practical and political minefields through which district councils are obliged to navigate, often with very limited resources'*. John Kneebone, August 2000.

The Local Government Act (from Willis 2004)

The Local Government Act 2002 (LGA) provides a broad mandate under the Resource Management Act 1991 (RMA) for local authorities to involve themselves in economic, social, environmental and cultural issues. Since the Local Government Act was recently amended to include biodiversity, the involvement of councils throughout New Zealand, towards encouraging and supporting biodiversity efforts in their communities, will certainly contribute toward at least maintaining biodiversity.

The Resource Management Act has always provided for 'the life supporting capacity of ecosystems'. Biological diversity (biodiversity) provides a measure of 'life' in ecosystems. From 1 September 2003, the Resource Management Ammendment Act contains specific provisions relating to 'biodiversity', and ascribes specific roles to Regional and District Councils.

Many councils are now taking into account biodiversity outcomes in their biosecurity, environmental education, freshwater and coastal management programmes; and some are taking account of biodiversity in their asset management and other systems.

The recent Local Government Act 2002 provides an opening for local government to exercise a wider sustainable development mandate. There is an opening to provide for biodiversity under this Act, providing councils and communities understand how biodiversity supports the well-being of the community and their environment.

Interest in biodiversity is growing across the country, with many local community-based restoration projects; an upsurge in demand for covenants; new central government funding; regional environmental enhancement funds; and initiatives by private landholders.

Biodiversity is not just an issue with environmental implications. It is an issue that is relevant for anyone concerned about the sort of economic, social and cultural future they want for their children. Maintaining biodiversity not only has environmental benefits but it also has:

- *Economic* benefits in the form of ecosystem services (such as pollination, soil stability and fertility, maintaining water quality), tourism opportunities, and potential commercial and medical uses
- *Social* benefits in the form of a distinctive national identity as well as various recreational and research and educational benefits
- *Cultural* benefits in the form of being able to recognise and continue Māori traditions, knowledge and customary uses.

Many local authorities in New Zealand are home to species found nowhere else in New Zealand — in fact often nowhere else in the world. Local action can make a difference, and indeed local action is very often the only thing that does make a difference.

The Local Authorities' role in biodiversity under the Resource Management Act (from Willis 2004)

Although local authorities have a great deal of discretion about what and how much they do under the Local Government Act (determined in part by what the community identifies as desired outcomes), it also has many *mandatory* functions under both the LGA and other statues. Maintaining biodiversity is one of those functions. The Resource Management Amendment Act 2003 clarified that managing biodiversity is an explicit function of both regional councils and territorial authorities. They must provide for the maintenance of biodiversity in regional and/or district plans.

The Resource Management Amendment Act 2003 introduced a definition of *biological diversity*. It is a definition that is broadly consistent with the definition set out in the Convention of Biological Diversity. The definition states:

> *'Biological diversity means the variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems'.*

- Section 30 (1) (c) (iiia) provides that it is a function of regional councils to control the use of land for the purpose of the maintenance and enhancement of ecosystems in water bodies and coastal water
- Section 30 (1) (ga) provides that it is a function of regional councils to establish, implement and review objectives, policies and methods for maintaining indigenous biodiversity
- Section 31 (b) (iii) provides that it is a function of territorial councils to control the effects of the use of land on the maintenance of indigenous biological diversity.

These new provisions complement and strengthen the provisions of the Resource Management Act 1991 which already recognised in its purpose and principles, the importance of the *life-supporting value of ecosystems* [section 5 (2) (b)], *areas of significant indigenous vegetation and significant habitats of indigenous fauna* [in section 6(c)], and the *intrinsic values of ecosystems* — defined to include biological diversity [section 7(d)].

Local action is endorsed and supported by both a national and international policy framework in the form of the New Zealand Biodiversity

Strategy that establishes national goals and objectives and identifies many prospective measures that require action and commitment by local government, as part of the overarching United Nations Convention on Biological Diversity that calls for countries to develop national strategies.

Human influences
The next area to consider is what we could be doing in our own backyards to assist in reaching the biodiversity objectives of councils and central government. In other words, how can New Zealanders do their bit at the 'grass-roots' level?

Human activities in the landscape can often have major impacts upon biodiversity that ripple through other levels of biological organization, affecting species composition and abundances, gene flow, and ecosystem processes. Biodiversity is multi-scaled, and is considered at genetic, species, and ecosystem levels and needs to be applied at a landscape level in the urban environment.

Disturbance to forested landscapes has produced fragmented patches of remnant bush, often producing a drier microclimate than the original, more extensive forest, a loss of forest interior species, a reduction of genetic diversity in the remaining populations, and the invasion by exotic weed species. Fragmentation is a process that does not appear immediately as such, but evolves from gap formation or perforation of the landscape. Gradually, the gaps become larger and the matrix is no longer natural. Decreasing patch size leads also to an increase in edge effects.

Historically, urban development has often involved disturbance of the land and loss of backyard biodiversity. Disturbance is any activity that brings about discontinuous change to the biotic assemblies. Disturbed areas will, over time, be re-colonised, but often without the same diversity. Urban areas are less resilient than more natural areas, and are often re-colonised by totally alien species — the introduced weeds and pests.

Private land biodiversity management
Management of biodiversity on private land involves:

- Maintaining indigenous species
- Coordinating site management with the surrounding landscape
- Protecting factors and processes critical to biodiversity viz. topography, natural disturbance and succession
- Maintaining landscape connectivity
- Minimizing or eliminating artificial edge effects
- Controlling non-native weed and pest species
- Limiting disturbance
- Protection of sensitive habitat features such as wetlands
- Exploring habitat enhancement or restoration to offset impacts.

These problems cannot be solved patch-by-patch, but only across all patches and their matrix at a landscape scale. Habitat fragmentation occurs at a landscape level, so how do we create connections between remnant bush areas that have become island habitats, particularly within urban areas on private land?

A solution for creating connectivity of fragmented landscapes is through the use of the Bushways concept[1].

A CASE FOR BUSHWAYS™
The role of Bushways is to '*facilitate the maintenance of biological diversity by maintaining and enhancing connectivity between indigenous species and systems*'.

So what constitutes a Bushway? Bushways are not merely a linear corridor connecting patches; they are broad ecological open-spaces of natural areas integrated with the broader landscape matrix to form connectivity between remnant patches and:

- Range from forest to tussock grassland to wetland habitats
- Follow natural features
- Link open spaces, natural reserves, parks, cultural features and historic sites

[1] Note: Bushways™ or related terminology is the protected property of Gilbert Brakey and Gecko NZ.

- Provide benefits for biodiversity conservation, recreation and economic development
- Connect the mountains to the sea
- Incorporate ecological, recreational, cultural and historical components
- Are publicly and/or privately owned
- Urban Bushways, connect communities to the outdoors and enables them to identify with their natural surroundings.

Bushways range from forest to tussock grassland to wetland habitats, and are managed for conservation and/or recreational purposes. They also follow natural land or water features, linking open spaces, natural reserves, parks, cultural features, and historic sites with each other and with populated areas, providing benefits for biodiversity conservation, recreation and economic development while enhancing the quality of life for people of all ages, abilities and economic means.

This connection from the mountains to the sea can be utilised as part of Integrated Catchment Management programmes, incorporating the ecological, recreational, cultural and historical components. They may be publicly owned, privately owned or a combination of both.

Bushways in cities and other urban areas encompass natural or man-made features, and connect communities to the outdoors and to each other, forging partnerships for a sustainable future in New Zealand. Bushways give communities a way to define and protect some of New Zealand's most precious resources.

URBAN NEIGHBOURHOOD BUSHWAYS™

So how can Bushways be used in an urban context to facilitate the maintenance of biodiversity? Urban Neighbourhood Bushways have the following features:

- Linking natural remnants inside or outside the urban area
- A role in environmental education
- Greening programmes
- Recreational role
- As reservoirs or refuges for wildlife
- As conduits for wildlife
- As barriers to development
- Provision for public services
- Need to be marketed as an asset
- Need to be well planned and designed.

Urban Neighbourhood Bushways provides a mechanism for linking natural remnants inside or outside of the urban area. They are important, particularly if they have adjoining areas of planted natural vegetation. The management of Bushways depends upon their nature and use. The functions and purposes of Urban Neighbourhood Bushways are varied, and include value as landscape features, their role in environmental education, greening programmes, and for recreation, as reservoirs or refuges for wildlife, as conduits for wildlife, barriers to development, and for public services, viz. power-lines, roads, highways and storm-water drainage.

Urban Neighbourhood Bushways ideally should be integrated with adjacent natural and recreational areas. Long term, they need to promote nature conservation. Research is also essential to establish effective management techniques for multi-purpose utilization and conservation, to determine social values and attitudes or needs of the community. Urban Neighbourhood Bushways have to be marketed in the community as a valuable and highly functional asset. They need to be well planned and designed to become an integral part of the urban framework, and preferably should not evolve from 'left-overs' after development.

At Gecko NZ we are presently working on the concept of developing Backyard Urban Neighbourhood Bushways, which would enable private landowners in urbanised environments to contribute toward biodiversity conservation, through the use of an ecologically based bio-landscape (biologically diverse landscape) approach. An example of this work is provided by the Oratia Stream project in Auckland (Fig. 1).

BACKYARD BUSHWAYS™

- Integral part of an ecologically based bio-landscape approach
- Ecological retrofitting of older neighbourhoods
- Replace unwanted grassed areas with native plant bush gardens

- Make use of boundaries to increase ecological quality.

Backyard Bushways form an integral part of an overall bio-landscape plan for private properties in urban areas, either individually or collectively. Individual properties irrespective of size often have become patches, particularly where areas of remnant bush are still to be found. Native vegetated areas on the other hand may be negligible or non-existent on most urban properties today and landscaping would need to use an integrated ecological approach in re-establishing an appropriate bio-landscape.

It should be possible to contemplate the retrofitting of older urban areas to obtain a more ecological approach, while allowing freedom for personal preferences as to detail of landscaping for individual properties, and obtaining overall ecological and visual connectivity for the neighbourhood. The larger the overall area of the neighbourhood dedicated to native plant bush gardens, the greater the overall ecological effect.

Often bushed areas are perceived as messy and untidy, a perception that with good design can be overcome without losing ecological integrity. However, there does also need to be a change in people's traditional view of such areas, which can be achieved through education.

Joan Nassauer, Professor of Landscape Architecture at the University of Michigan, is highly regarded by both science and design professionals for her ongoing work focusing on the intersection between landscape perception and landscape ecology (e.g., Nassauer 1993, 1995, 1999, 2002; Nassauer et al. 1997; also see http://www.snre.umich.edu/faculty-staff-directory/faculty-detail.php?people_id=104).

Nassauer's unique approach to ecological design strives to overcome the common perception that biodiverse landscapes in settled areas are 'messy, weedy and unkempt' through gaining a systematic understanding of what people consider attractive, and using this as a design tool. Thus, she is able to give 'messy ecosystems' culturally informed 'orderly frames' so they are recognised as attractive and are accepted and emulated.

One important example of Nassauer's pioneering work in this area is the 'ecological retrofit' of a 1950s neighbourhood in Maplewood, Minnesota (Nassauer et al. 1997; also see http://www-personal.umich.edu/~nassauer/). Her research and design led to the removal of traditional kerbs and gutters and the installation of highly popular rainwater gardens (Fig. 2) — an approach now spreading to other neighbourhoods. More particularly it creates an opportunity for ecological connections throughout the suburban neighbourhood.

Gardens need to incorporate the maximum coverage of appropriate native vegetation for greater biodiversity opportunities (Fig. 3). Where lawns are not needed, they can be replaced with eco-sourced natives. Exotic plant species can at times be advantageous as a food source for nectar-feeding birds and animals, so long as they do not have seed dispersal systems, which could prove to be a future weed threat.

Many gardens in suburban neighbourhoods have gardens, hedges or fences along property lines. These boundary edges create privacy and establish boundaries. Planting can be added to increase ecological quality, creating stronger urban ecological networks more suited to native wildlife, and connecting front yard areas with Backyard Bushways.

Backyard Bushways need to be the widest and most continuous connection that knits together the garden network. Planting backyard property lines creates a Bushway that allows the flow of plants and animals up and down the block. The wider the Backyard Bushways the better the habitat potential will be. Where Backyard Bushways intersect side boundary plantings, they can be widened to create a more substantial node.

Backyard Bushways can be used to connect to neighbourhood parks, which could also be designed to enhance biodiversity, and would form the most concentrated nodes of

urban habitat in the neighbourhood. More species of wildlife are likely to use these nodes because their width will provide more suitable interior conditions. They can be designed to contribute to the overall amenity character of the neighbourhood and to demonstrate the range of plants that private property owners might consider using. Neighbourhood Bush Reserves may well incorporate the use of wetlands as bioremediation areas removing sediment and heavy metals, forming part of an overall natural drainage system for urban storm-water run-off.

Backyard Bushways can form part of a community-based Urban Neighbourhood Bushways system, or link with the local Council's green-network system, e.g., the 'Green-Network' system that has been established by the Waitakere City Council (Fig. 4).

CONCLUSION

In conclusion, I would like to reiterate that Backyard Bushway offer a means of increasing biodiversity opportunities within the urban fabric, on both private and public land.

They can be used to create a broad green infrastructure system leading to a network of plants, integrated with the wider landscape matrix, linking natural areas, historic sites, parks and open space providing benefits for biodiversity conservation, recreation and economic development while enhancing the quality of life for people of all ages, abilities and economic means.

REFERENCES

Department of Conservation (DOC) and the Ministry for the Environment (MfE) 2000: The New Zealand biodiversity strategy: our chance to turn the tide. Wellington, Department of Conservation and Ministry for the Environment. 144 p. Available at http://www.biodiversity.govt.nz/picture/doing/nzbs/contents.html.

Kuschel, G. 1990: Beetles in a suburban environment: a New Zealand case study. The identity and status of *Coleoptera* in the natural and modified habitats of Lynfield, Auckland (1974–1989). *DSIR Plant Protection Report 3*: 1–118.

Leopold, A.1949: A Sand County almanac — and sketches here and there. New York, Oxford University Press. 226 p.

Ministerial Advisory Committee 2000a: Biodiversity and private land: final report of the Ministerial Advisory Committee. Wellington, Ministry for the Environment. 112 p. Available at http://www.mfe.govt.nz/publications/biodiversity/.

Ministerial Advisory Committee 2000b: Bio-What? Addressing the effects of private land management on indigenous biodiversity. Wellington, Ministry for the Environment. 103 p. Available at http://www.mfe.govt.nz/publications/biodiversity/.

Mussared, D. (undated): Biodiversity in your backyard — it's a jungle out there! Department of the Environment and Heritage, Australian Government. Available at http://www.deh.gov.au/biodiversity/publications/articles/jungle.html.

Nassauer, J. I. 1993: Ecological function and the perception of suburban residential landscapes. *In*: Gobster, P. A. *ed*. Managing urban and high use recreation settings. General Technical Report, USDA Forest Service North Central Station. Pp. 55–60.

Nassauer, J. I. 1995: Culture and changing landscape structure. *Landscape Ecology 10(4)*: 229–237.

Nassauer, J. I.; Halverson, B.; Roos, S. 1997: A project for the city of Maplewood, Minnesota by the University of Minnesota, Department of Landscape Architecture. University of Minnesota, Department of Landscape Architecture.

Nassauer, J. I. 1999: Ecological retrofit. *Landscape Journal 17(2):* 15–17.

Nassauer, J. I. 2002: Messy ecosystems, orderly frames. *In*: Theory in landscape architecture: a reader. Simon Swaffield *ed*. University of Pennsylvania Press. Pp. 196–206. (Reprinted from *Landscape Journal*, 1995).

Willis, G. 2004: Guideline on strategic planning for biodiversity. A report for Action Bio-Community on using LTCCPs to promote better biodiversity management. Auckland, Enfocus Limited. 20 p. Available at http://biocommunity.org.nz/detail.php?area=tb_id=8&ar_id=145.

Fig. 1 Oratia Stream proposal, Auckland — Urban Neighbourhood Bushway™ (prepared by Gecko Ltd. for Ecowater (WCC) in 2001).

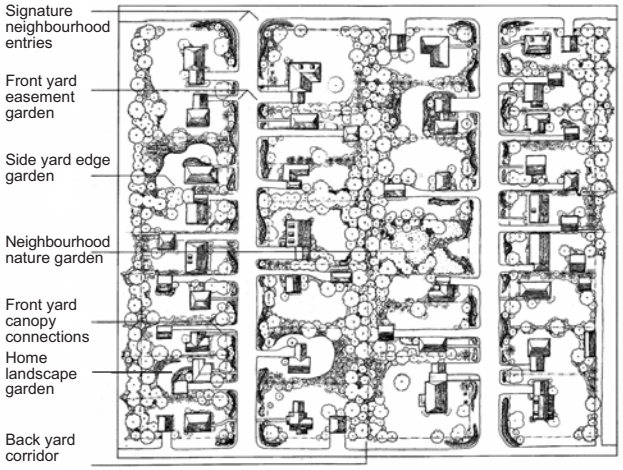

Fig. 2 Ecological retrofit for an older neighbourhood in Maplewood, Minnesota. (From Nassauer 1993).

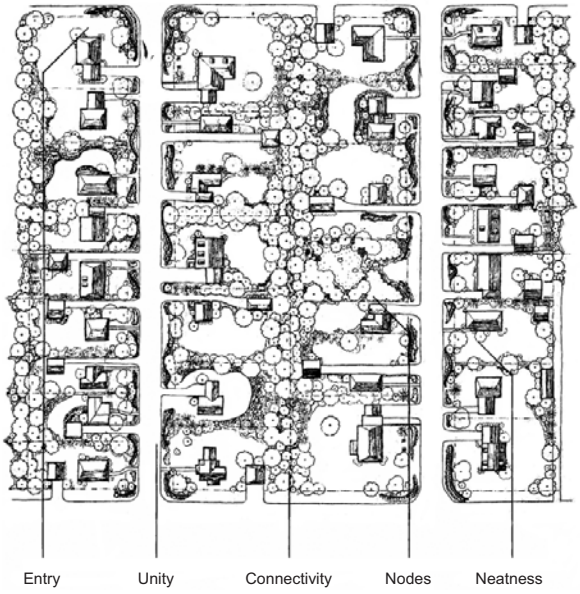

Fig. 3 Ecological design of key areas in a suburban area can incorporate the maximum coverage of appropriate native vegetation for greater biodiversity opportunities. Maplewood, Minnesota. (From Nassauer 1993).

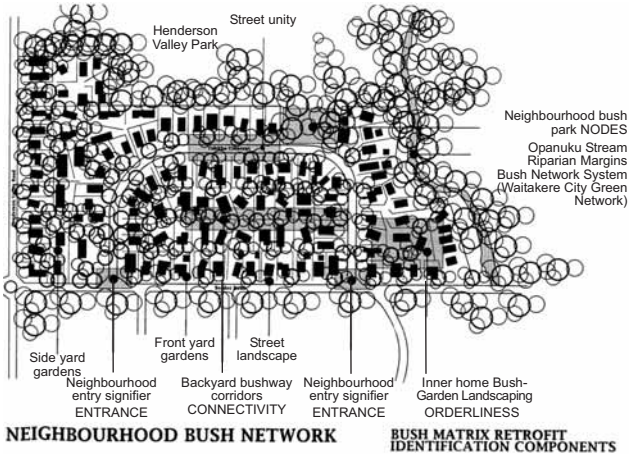

Fig. 4 Tabitha Crescent, Waitakere City — an example of Bushways™ in action. Proposal prepared by Gilbert Brakey in 2000.