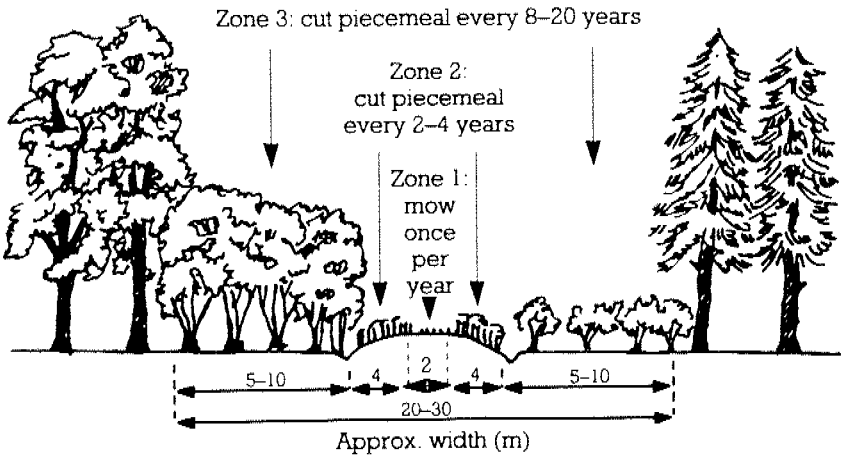
Figure 5.3 **Treatment of ridesides in commercial plantations for invertebrate conservation**



Roads and highways

In the UK there are about 200,000 ha of roadside verges (Thompson 1986) and in North America about 4 million miles of roads provide usable habitat (Leedy 1978). In Australia there are about 866,000 km of roads (Lay 1984). Some animals such as amphibians and mammals are at risk when crossing roads, and as a result various kinds of underpass have been designed (Anderson *et al.* 1993). Roadsides are however also used as both habitats and, may be corridors for dispersal. For example, some animals are attracted to roadsides as places to feed or bask. Kestrels feeding on roadsides in Britain are a common sight and equally common are reptiles basking on roadsides in North America and Australia.

Some kinds of roadside verges have been identified as being potentially suitable wildlife habitats. In Britain some (usually old verges on minor roads) are listed as sites of county importance for wildlife. 20 of 50 species of mammals, all six reptiles, 40 of 200 bird species, five of six species of amphibians and 25 of 60 butterflies have been reported from roadside habitats (Way 1977). However, the impact of new roads cannot be mitigated by the creation of wildlife habitats on roadside verges (Anderson *et al.* 1993) and the area of roadside verges does not compensate for the loss of habitat brought about by the construction of roads. The width and physical structure of roadside verges is determined largely by engineering constraints and the planting and management of roadside verges has likewise largely been undertaken in a manner established by engineers. However, in Britain there have been some recent studies of seed mixtures and mowing regimes on road verges with the aim of making the verges suitable habitat for native wildflowers and insects such as butterflies (Burt 1990). In North America, efforts to improve roadside habitats for wildlife have been half-hearted (Leedy 1978). Fortunately much research has and continues to be directed towards establishment and management of roadside vegetation for wildlife while taking into account visual and highway management considerations (see Bennett 1991; Burt 1990; Kelcey 1975; Anderson *et al.* 1993).

Railway linesides

British Rail has approximately 11,000 miles of route and about 30,000 hectares of land immediately adjacent to the track. These linear strips of land offer a challenge in terms of cost-effective management for landscape and wildlife habitats, while ensuring that the lines are not affected by fallen leaves or other kinds of debris. At one time, when steam locomotives were in use, there was also a need to keep vegetation to a minimum because of the risk of fire. In Britain, seven broad categories of railway line vegetation have been identified, each of which may require a different form of management (Sargent 1984). These include fine grassland, coarse grassland, low scrub, slow growing uncompetitive scrub, competitive invasive scrub, and woodlands (Table 5.2).

In 1987 a pilot project was initiated in Hampshire with a view to developing a modern management policy for rail lineside vegetation that can in due course be applied throughout the country. The 'Hampshire Lineside Project' has adopted a systematic approach to management, involving mechanical flailing, coppicing, tree thinning and felling. This vegetation policy for rail linesides should deliver practical benefits such as safety (reducing risks of unstable trees falling on lines and increasing visibility for train drivers), wildlife conservation and landscape (for passengers and communities living by railway lines).

Table 5.2 Management of linear habitats along railway lines (From Sargent 1984)

Fine grassland

Occurs mainly on thin poor soils in cuttings. Many sites are species-rich in herbs, and the encroachment of shrubs and coarse grasses needs to be prevented. Burning is not recommended because this may encourage coarse grasses.

Coarse grassland

These are on rich soils mixed with ballast and decayed litter. Management is usually in the form of burning on a three to five year cycle (to prevent scrub encroachment) but where there are embankments, scrub encroachment and trees could be encouraged.

Low scrub

This is a category with low scrub mixed with brambles, ivy and clematis. It tends to be of limited wildlife and aesthetic interest. The suggested management is to clear the scrub and then burn to encourage grass swards.

Slow growing uncompetitive scrub

This consists mainly of slow growing species such as guelder rose, dogwood and privet. Management here is aimed at conserving the scrub partly by flailing and removal of trees.

Competitive invasive scrub

The main species are hawthorn, ash and sycamore. Where the trees are not going to interfere with the trains, they could be left to develop naturally. In cuttings, the trees need to be cut back.

Woodland

Natural woodland containing slow-growing species should be encouraged except in areas where there may be interference with the trains. Management of plantation woodland, as elsewhere, depends on the age of the stands, and old stands could be a danger to the lines. In general, management should be directed towards establishing gaps and mixed-age stands.

Linear habitats in urban environments

Urban environments provide opportunities to combine the wildlife, educational and recreational value of linear habitats, and indeed pressures on land sometimes demand that there be a combined use. The environmental importance of linear habitats is an added benefit in urban environments, especially in relation to the role of trees and shrubs helping to moderate the climate and reduce levels of dust and pollutants. For example existing linear habitats may be retained or new ones created as buffer zones between housing developments and roads.

Identification and subsequent management of linear habitats in urban environments depends in the first instance on the relevant legislation and development policies and thereafter on the perceived need to provide facilities for education, recreation and wildlife. The integration of linear habitats in their various forms into strategic planning offers one useful way of enabling wildlife and development to coexist. Urban environments have the potential to provide many different kinds of linear habitats for a variety of purposes and it would seem useful therefore to classify linear habitats, as for example in the Cleveland Wildlife Strategy (Table 5.3).

Table 5.3 Classification of wildlife corridors adopted by the Cleveland Wildlife Strategy

a. Strategic Wildlife Corridors

These are open-space corridors of particular significance on a countywide basis. They are the longest of the wildlife corridors and sweep across areas of mainly agricultural land containing important wildlife sites. They indicate the major open passageways between and into the urban areas.

b. Local Wildlife Corridors

As the name suggests, these form a more localised corridor network linking rural and urban areas within and between each district. They consist mainly of urban greenspace together with important wildlife sites but on a slightly smaller scale than their strategic counterpart to which many of them are connected. The close proximity of these corridors to the urban areas of Cleveland means they are of considerable importance.

c. Wildlife Links

These are narrower than local wildlife corridors but in many cases longer as they include man-made linear features such as railway embankments, disused waggonways, road verges, pathways and natural features such as streams. These help form an intricate web for the movement of wildlife and people throughout the county.

Although specific uses for a linear habitat within an urban environment can easily be defined, the ultimate design will not necessarily be determined entirely by those uses. Recommendations on the best design for various kinds of linear habitat, especially those used to separate land uses and buffer residential areas from various perturbations, will need to take account of the selection of plant species, the ratio between shrubs and trees, the density of planting and the possibility of varying the width at different points.

Linear habitats can have environmental and recreational benefits, but losses in biodiversity are now so serious that it would seem only right to try and combine wildlife interests with other functions of linear habitats wherever possible. Excellent opportunities for combined wildlife, environmental and recreational use of linear habitats present themselves in the form of greenways within urban developments. Whereas urban parkland (simple structure, intensive management) can be of only

minimum use for the more hardy and common species of wildlife, wide linear features such as greenways with suitable diversity of features can support a wide variety of wildlife. Mixtures of native species (grasses, herbs, shrubs, trees), dead trees, rocks, streams and meandering paths are features which contribute to a diverse environment and which in turn help to support a rich variety of wildlife. Ground cover is especially important.

Management costs

The costs of management will naturally be an important consideration for any authority undertaking to establish or maintain linear features. From a wildlife point of view, greater diversity within a linear feature will help to support a rich variety of wildlife. This diversity may at first seem expensive to manage but, on the other hand, some of the alternative treatments such as regular and extensive grass mowing (common in urban parks) would not be necessary and there would therefore be a cost-saving. Similarly native species may need less care than many exotic species, again reducing costs.

Additional financial benefits arise out of the environmental benefits (moderated climates, less soil erosion, reduced noise levels etc) and these need to be brought into the equation (Table 5.4).

Table 5.4 **Benefits of urban greenways (based on an American study adapted from National Park Service 1990)**

Summary of findings	
Real property values	Many studies demonstrate that parks, greenways and trails increase nearby property values. In turn, increased property values can increase local tax revenues and help offset greenway acquisition costs.
Expenditures by residents	Spending by local residents on greenway related activities helps support recreation oriented businesses and employment, as well as other businesses which are patronised by greenway and trail users.
Commercial uses	Greenways often provide business opportunities, locations and resources for commercial activities such as recreation equipment rentals and sales, lessons, and other related businesses.
Tourism	Greenways are often major tourist attractions which generate expenditures on lodging, food, and recreation oriented services. Greenways also help improve the overall appeal of a community to prospective tourists and new residents.
Agency expenditures	The agency responsible for managing a river, trail or greenway can help support local businesses by purchasing supplies and services. Jobs created by the managing agency may also help increase local employment opportunities.
Corporate relocation	Evidence shows that the qualify of life in a community is an increasingly important factor in corporate relocation decisions. Greenways are often cited as important contributors to the quality of life.
Public cost reduction	The conservation of rivers, trails, and greenways can help local governments and other public agencies reduce costs resulting from flooding and other natural hazards.
Intrinsic value	While greenways have many economic benefits, it is important to remember the intrinsic environmental and recreation value of preserving rivers, trails and other open space corridors.

6. FUTURE DIRECTIONS

The nature of linear habitats, stepping stones and wildlife corridors is tremendously varied, ranging from the migration routes used by birds, large mammals and marine life, through roadside verges, to ditches in cities. Many linear features such as hedges, rivers, roads and railway lines can be managed as wildlife habitats, but these linear features also have environmental and recreational benefits. There are some disadvantages in that some pest species have been known to disperse along linear habitats, but in general the benefits far outweigh the disadvantages.

In urban developments in particular, linear habitats can offer several advantages. The creation of greenways, for example, combining the wildlife, recreation, education, aesthetic and environmental benefits of linear features, seems to be a growing trend. Indeed, some authorities are not only conserving existing linear habitats but are also restoring and creating such features. The methodology for establishing linear features such as avenues of trees as landscape features and hedges as buffer strips has been well researched. Similarly the management of such features has been examined in depth. By way of contrast, management of linear features as wildlife habitats has received less attention, with the common assumption that linear features do provide habitats as well as corridors between habitats. That wildlife does benefit from linear habitats is without question, but there is no doubt that linear features could make an even greater contribution to wildlife if more research was directed at the behaviour, ecology and genetics of wildlife in linear habitats.

Although there is much evidence to show that some forms of wildlife do use linear features for movement, there still remain questions about the effectiveness of the linear features as corridors in so far as population viability is concerned. Many linear features have gaps. How significant in terms of its corridor function are the types and frequency of gaps in a linear feature?

Finally, there seems to be a need for a broader or large-scale look at wildlife in the environment. Much attention has been focused on protected areas and fragments of natural communities, but if we are to conserve wildlife effectively we need to think of networks of habitats and linear features. These networks could equally well apply to rural and well as urban areas. In other words, isolated nature reserves by themselves cannot hope to be effective. The combined use of linear features, nature reserves and other areas of remnant semi-natural habitat seems to be a useful way forward for devising nature conservation strategies, particularly where there is scope for adding to them through imaginative habitat restoration.

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