Gardens, backyards, and urban areas

Malcolm Ausden

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Abstract and Keywords

Urban areas, gardens, and backyards can support a diverse range of wildlife, including a number of species rare in or absent from more semi-natural habitats. This chapter discusses the general principles of the management of these areas. It also briefly discusses management of mineral-extraction sites and developed land or buildings that are not currently in use, commonly known as brownfield or post-industrial sites. Mineral-extraction sites usually occur in the wider countryside, but are discussed here because of their similarity to brownfield sites.

Keywords: habitat management, wildlife conservation, mineral extraction sites, brownfield sites, post-industrial sites
Urban areas, gardens, and backyards can support a surprisingly diverse range of wildlife, including a number of species rare in or absent from more semi-natural habitats (Figure 11.1). There are numerous guides to the specifics of managing these and other urban spaces for wildlife. This chapter will focus on the general principles of this management. It also briefly discusses management of mineral-extraction sites and developed land or buildings that are not currently in use, commonly known as brownfield or post-industrial sites. Mineral-extraction sites usually occur in the wider countryside, but are discussed here because of their similarity to brownfield sites.

In temperate areas the low-nutrient and well-drained ground of brownfield and some mineral-extraction sites can be of exceptional conservation value for invertebrates, which on the cool edges of their range require warm, open early-successional habitat (Harvey 2004; Figure 11.2). Some brownfield sites also retain relict areas of semi-natural habitat, including patches of wetland. Areas of industrial waste products can support very characteristic assemblages of plants. Notable among these are spectacular displays of orchids of the genus *Dactylorhiza* on the infertile, alkaline conditions of weathered pulverized fuel ash (PFA) and characteristic assemblages of rare lichens on metal-rich mine workings (Purvis 2001). Brownfield sites, though, are usually viewed as waste ground and subject to re-development, or pressure to tidy them up to create green spaces for recreation. Similarly, mineral-extraction sites are often ‘restored’ to other priority habitats or by replacing topsoil and land-forming to create gentle, grassy slopes. These activities destroy any existing conservation value.

Buildings can provide important nest sites for some bird species and roosts for bats. In the south-eastern USA a large proportion of the Atlantic coast population of least terns, *Sterna antillarum*, nest on gravel-covered roof-tops. In the state of Georgia 73% of least terns nest on rooftops, compared to only 1% on beaches (Krogh and Schweitzer 1999). Peregrine falcons, *Falco peregrinus*, nest on ledges in many cities in North America and Europe, while a large proportion of the
populations of several swift species and even the threatened lesser kestrel, *Falco naumanni*, nest in roofs. Gravestones, walls, and old stone buildings can support rich assemblages of lichens that extend their range in lowland areas where other suitable rocks are rare or absent. Overall, urban areas typically support a greater species richness of alien/exotic, and in some cases also native, plants compared to the surrounding landscape (Roy et al. 1999; Kühn et al. 2004). They can also contain far higher densities of ponds than in the wider countryside. In the city of

*Fig. 11.2* ‘Brownfield’ sites and invertebrates. This 20-ha former ash field in East London contains a mixture of bare and sparsely vegetated ground, well-drained herb-rich grassland, seasonally wet areas, and scattered scrub. It supports an exceptional invertebrate fauna containing a high proportion of rare species. Twelve per cent of the approximately 800 invertebrate species recorded there are found in less than 4% of the 10-km squares in Great Britain.

*Fig. 11.1* The value of UK gardens for plants and invertebrates.

Invertebrates: the most comprehensive survey of a garden for invertebrates has been a 15-year study of a 741-m² suburban garden in Leicestershire, England (Owen 1991). This garden was managed to provide good habitat for wildlife, but was not atypical in the features that it contained: lawns, herbaceous borders, vegetables, fruit bushes, rockeries, shrubberies, a compost heap, a few trees, and a small pond. Over a 15-year period 1602 species of insects and 121 species of other invertebrates were recorded.
Sheffield, England, 14% of dwellings are estimated to have ponds in their gardens, providing an estimated total of 25200 garden ponds in the entire city (Gaston et al. 2005a)! Because some groups of insects were known to have been under-recorded, the total number of species visiting the garden over this period will have been considerably higher. Many of the species will undoubtedly have been only temporary colonists in the garden and a high proportion of the winged insects recorded must have only been passing through. However, the number of species recorded is still impressive! Of the parasitic wasps recorded, 20 were believed to be new records for Britain and a further four were previously undescribed to science. Of the insect groups thought to have been well recorded, an amazing 21% of the known British fauna were found in the garden.

11.1 Managing urban areas, gardens, and backyards for wildlife

There is often a distinction made between nature conservation in urban areas and the wider countryside. Management of urban green spaces usually places a higher value on recreational and educational needs and community involvement. Habitats in urban areas have also rarely been subject to long periods of traditional management. Consequently, conservation of cultural habitats and consideration of the needs of specific plants: a survey of 60 gardens in the city of Sheffield, England, found that they contained an amazing total of 1166 species of vascular plants. Thirty per cent of these were native species (Smith et al. 2006), this representing approximately a quarter of the UK’s native vascular flora. Golden plusia moth, Polychrysia moneta (pictured). This is one of the 28 species of moths in the UK that are more or less restricted to gardens, parks, orchards, and the outside walls of buildings (from Emmett and Heath 1991). Most are restricted to these habitats because their larval foodplants are alien/exotic species confined to these habitats. In the UK golden plusia moth caterpillars feed on cultivated delphiniums and larkspurs, Delphinium spp., in gardens.
rare species is less often a consideration. Most practical differences in management between habitats in urban areas, gardens, and backyards and those in the wider countryside are due to their small size, requiring them to be managed more intensively to maintain their interest, and the impracticality of using grazing or burning to arrest succession. Cutting and removal is generally used instead.

Despite these differences, there is still the potential to manage large areas of urban green space using similar techniques to those in the wider countryside (Figure 11.3). An example of a nature reserve in an urban setting, which is important for protecting endangered species, is the 250-ha Karori Wildlife Sanctuary in Wellington, New Zealand. This is surrounded by a fence to protect its inhabitants from alien/exotic predators.

The main techniques for managing habitats in urban spaces, gardens, and backyards or wildlife are:

- minimizing or avoiding harmful gardening practices, especially pesticide use;
- planting flowers, shrubs, and trees that provide good wildlife habitat;
- creating features that provide good habitat for wildlife such as ponds, marshy areas, wildflower meadows, and piles of logs and other plant material;
- providing artificial nest and hibernation sites.

In addition, artificial feeding can be used to attract birds and mammals to gardens and backyards and in many cases probably increase their population sizes. Predation by domestic cats is often an issue.

Another consideration when designing a garden or backyard to benefit wildlife is to ensure that fences do not unduly impede movement of animals between them, for example the annual migrations of toads to and from breeding ponds.

When creating and managing habitats in urban areas, gardens and backyards, it is also important to consider the effects of these activities on the wider environment. In particular, using peat and peat-based compost will encourage destruction of valuable peatlands and using weathered limestone for rockeries will encourage destruction of limestone pavement. Designing an area that requires frequent watering will
increase pressure on often scarce water resources, which might impact on wetlands.

**(p.359)**

**(p.360)**

11.1.1 Minimizing or avoiding harmful gardening practices

A visit to most garden centres reveals the bewildering array of herbicides, insecticides, fungicides, acaricides, molluscicides, and rodenticides available for use in gardens. In Europe an estimated €560 million are spent each year on pesticides for homes and gardens (European Crop Protection Association figures for 2000). Any pesticide that is effective against its target groups, irrespective of how ‘garden friendly’ it is considered to be, will still be damaging.

*Fig. 11.3* Stockholm’s National City Park. This comprises a wedge of 27 km2 of land and water stretching into the middle of Stockholm. Most is managed in a low-intensity manner, with plenty of tussocky grassland, dead wood, and other features normally associated with the wider countryside. These photographs were taken within 3 km of the city centre.
Many types of garden plants will succumb to the effects of insects, snails, and slugs unless dosed with pesticides. If you want to avoid using pesticides, then it is best to choose hardy plants that are best suited to the climatic and soil conditions of your area, and just give up on trying to grow more sensitive species that require constant watering, fertilizing, and protection from invertebrates and disease. Doing so will also increase the amount of time you can spend enjoying your garden or backyard, rather than on maintaining it. A good starting point is to look at which types of attractive plants are growing well in surrounding gardens and backyards, particularly those that are regenerating naturally and becoming weeds themselves.

Potentially harmful effects of trimming and pruning can also be reduced. Bushes can be trimmed less frequently to minimize numbers of caterpillars removed from the plant with cut foliage. Some authors suggest leaving the clippings next to the plant for a day or two to increase the chances of caterpillars returning to it. Dead stems, shrivelled leaves, and flower heads should also be left in place, since these can be important food sources and over-wintering sites for insects. Conversely, judicious pruning can be used to increase and in some cases prolong the flowering period of some plants, and thereby potentially increase their value as nectar sources.

11.1.2 Planting flowers, shrubs, and trees that provide good wildlife habitat

The suitability of gardens and backyards for wildlife can be improved by selecting plants that provide:

- foliage for plant-eating insects;
- berries for birds and small mammals;
- shelter, cover, and variation in structure;
- nectar sources for insects (Figure 11.4).

These can be planted to create flower-rich borders in sunshine to attract warmth-loving insects and to create or enhance existing sheltered glades and (p.361)
woodland-edge habitat (see Section 7.4.1 regarding management of woodland edge, glades, and rides). Vegetation structure is an important consideration when designing woodland and woodland-edge habitat. Providing a canopy, understorey, and field layer will maximize the interest of the planting. Increasing the vegetation structure by mixed planting and creation of mosaics of shade and open areas will also probably increase the range of niches available for invertebrates.

Fig. 11.4 Flowery borders. This flowerbed is both beautiful and good for wildlife, and requires little maintenance. The plants have been chosen for their quality as nectar sources and insect foodplants, aesthetic appeal, structure, and suitability for conditions in the garden.

The plants in this border include, for example meadow crane's-bill, *Geranium pratense* (a good early-summer nectar source and which grows well at its sunny end), and dusky crane's-bill *Geranium phaeum* (a good spring nectar source that grows well in the shadier, drier conditions next to the hedge). Later in the year wild teasels, *Dipsacus fullonum*, grow up to provide nectar in mid–late summer, seeds for European goldfinches, *Carduelis carduelis*, and good winter structure in the garden. Other valuable nectaring
It is widely stated that native plant species support a richer invertebrate fauna than introduced species, and consequently there should be a presumption (p.362) for planting native species in urban areas. While this may be true for insects associated with many tree species, it is not necessarily the case for herbaceous plants. Gardens and backyards can provide valuable habitat for a variety of insects dependent on alien/exotic plant species, or on plants that are local or scarce in the wild, but frequently planted in gardens and backyards. In the study by Owen (1991) there were 68 species of moths whose larvae fed on plants in the garden. Of these, 46 fed on native plants and 38 on alien/exotic ones. Overall, 27% of native plant species in the garden were used by moth larvae, compared to 35% of alien/exotic plant species. The best way to increase the range of breeding moths is to maximize the range of foodplants of both native and alien/exotic species.

The value of gardens and backyards for nectar-feeding insects can be maximized by providing a continuity of suitable nectar sources throughout the season. As a general rule, flowers that attract butterflies also tend to be attractive to moths, but the reverse is not necessarily true. White flowers that are fragrant at night are usually good for attracting moths. Although there is a tendency for wildlife gardeners to prefer natural forms of native plants, many garden cultivars of these species produce far more flowers and have substantially longer flowering periods. There is, though, the potential danger of introducing cultivars that have the potential to interbreed with native stock outside of the garden or backyard.

11.1.3 Creating specific features for wildlife

The value of urban areas, gardens, and backyards for wildlife can be increased by incorporating features described in the following sections.
Piles of logs and other plant material, and compost heaps

Piles of logs and other plant material provide food and cover for a wide range of wood and other detritivore-feeding invertebrates and their predators. They also provide cover, nest, and hibernation sites for small mammals, reptiles and amphibians. Logs will provide habitat for fungi. As with dead wood in general, it is probably best to position logs in both sun and shade to attract the maximum range of species (Section 7.1.6). There is little information on the effectiveness of log piles in providing habitat for saproxylic invertebrates in gardens and backyards. However, the results of one study found that small stacks of silver birch logs in gardens were poorly colonized by saproxylic species, although they did provide habitat for a wide range of other invertebrates (Gaston et al. 2005b).

Ponds and marshy areas

Standard methods for creating garden ponds involve using an impermeable liner to create the pond and adding subsoil or other nutrient-poor material to provide a substrate but without raising nutrient levels too highly. Ponds should only be planted with native species. Many alien/exotic aquatic plants introduced by the garden trade have spread into semi-natural wetlands where they out-compete native vegetation. Any plants bought at garden centres should be checked for small fragments of invasive alien/exotic plants attached to them. It is also worth introducing key invertebrate species that are unlikely to ever colonize the pond. Valuable groups are zooplankton such as water fleas, Cladocera, and copepods, Copepoda, to feed on algae in the water column, and aquatic snails to graze algae on plants.

The wildlife interest of a pond can be maximized by providing a variety of different water depths and vegetation types. Shallow, warm margins are especially valuable for invertebrates. It is also worth creating areas suitable for the establishment of emergent plants and deeper areas that remain as open water and provide habitat for submerged and floating plants. Most fish decimate invertebrates and greatly reduce the pond's wildlife interest. They may also cause it to become dominated by algae by eating the zooplankton that feed on these algae and by stirring up the bottom sediments.
and releasing nutrients. Fish also make ponds unsuitable for most amphibians by predating their larvae.

Most ponds in gardens and backyards are isolated from other water bodies, surrounded by undisturbed vegetation or paved or other hard surfaces and have relatively stable water levels. In contrast, most semi- or near-natural water bodies are part of larger wetland complexes, surrounded by other semi-natural habitats and have variable and often large seasonal variations in water levels. To increase the value of these ponds for wildlife it is therefore worth considering:

- providing a variety of both permanent ponds and temporary pools, rather than just one single, permanent pond;
- designing ponds to have lower water levels in summer that expose damp mud and emergent vegetation;
- regularly disturbing vegetation around the margins of the pond to maintain early-successional habitat.

Permanent and seasonal water bodies support quite different assemblages of species. Creating both will increase the range of species in the garden, backyard, or other green space. Some amphibians prefer temporary pools for breeding (Figure 11.5). Observing variations in the fauna resulting from periodic drying out and re-flooding of ponds can add to their enjoyment. Seasonal variations in water levels are important features of most natural wetlands. Damp mud is an important habitat for many flies and beetles, while the drawdown zone of water bodies can support a quite different flora from that of (p. 364)
more stable water margins. It is therefore worth designing a pond so that at least a proportion of it has gently enough sloping sides to create a drawdown zone. Creating variation in topography within the drawdown zone will increase the variety of different microhabitats provided as water levels fall: wet and dry mud, tussocky edges, and drying-out pools. Additional periodic disturbance, especially pulling up plants, can be used to further increase variations in conditions on the pond's margins and prevent them from becoming dominated by one or a small number of more competitive perennial plants. The ideal is to do this little and often during the growing season, thereby mimicking conditions created by grazing and poaching by herbivores. It is also worth including a steeper profile and more stable vegetation or hard surface around a proportion of the pond's perimeter, so that people can get close to the water's edge and look for animal life in the water.

An excellent method to provide water for a pond is to connect it to a water butt or drainage system that collects water from a nearby roof, so conserving water resources. Connecting the

Fig. 11.5 Permanent ponds and temporary pools. Many species prefer temporary water bodies rather than permanent ones. This garden contains three ponds. Common frogs, *Rana temporaria*, only breed successfully in the shallow, largely unvegetated temporary one where their tadpoles are less heavily predated by smooth newts, *Lissotriton vulgaris*. Most smooth newts breed in the more vegetated, two permanent ponds.
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pond directly to the run-off from the roof, rather than via a water butt, will provide greater variation in water levels. It will mimic the situation in a more natural wetland where fluctuations in water levels vary depending on rates of inflow from its catchment—in this case the roof.

(p.365) The principles of preventing succession in garden or backyard ponds are the same as those in more natural water bodies, by regularly clearing out a proportion of the vegetation. Again, little and often is best; a rule of thumb being to never clear out more than a third of the pond at any one time.

Wildflower meadows and other grasslands
Conventional, closely mown lawns provide good foraging habitat for many birds that feed on soil invertebrates. They can also support a surprisingly diverse flora. The lawns in 52 gardens in Sheffield, England, supported a total of 159 vascular plant species, with an average of 24 species per lawn (Thompson et al. 2004). In shorter swards, trampled, and other bare areas can provide nesting areas for solitary bees.

The visual, and probably also wildlife, interest of existing lawns can be increased by mowing at different heights and frequencies to vary their structural and floral composition. This can be done on existing areas of lawn to allow low-growing rosette-forming and other forbs in the lawn to flower and provide nectar sources for insects. As in other grasslands, though, managing by cutting catastrophically removes habitat used by invertebrates. There is, therefore, the potential to create an ecological trap by encouraging them to colonize the grassland and then suddenly destroying the entire patch of habitat by mowing. Again, cutting small patches at periodic intervals during the growing season to simulate patchy grazing is probably best, but obviously more time-consuming.

Wildflower meadows will provide an additional habitat and can be visually stunning. It is best to remove the topsoil to reduce nutrient levels in the upper soil before establishing the meadow. Creating small-scale variation in soil types and topography increases small-scale variation in vegetation composition and structure. It is cheapest to establish the majority of plants from seed, and then add plugs, mature plants, and bulbs of plants that do not establish well from seed. During the establishment phase vegetation can be cut
around favoured individual plants to provide them with a competitive advantage. This can be important in helping forbs to establish, particularly if grass growth is vigorous.

The principles of managing botanically species-rich wildflower meadows in gardens and backyards are similar to those of managing other hay meadows (Section 5.5.1). However, the practicalities differ in several respects. In agriculturally managed meadows the date of cutting will often be a compromise between cutting late enough to achieve conservation objectives, and early enough to provide high-enough quality herbage for agricultural use. There will be no agricultural constraints when managing small meadows in urban areas, gardens, and backyards. Meadows can therefore be cut later in the season, ideally in autumn (p.366)

or even winter. It is, though, important to not cut all of the meadow at the same time, in order to provide a continuity of habitat for invertebrates and any small mammals. Tussocks and seed heads provide important over-wintering sites for invertebrates. As discussed in Section 5.5.1, aftermath grazing is important in maintaining the high botanical species richness of hay meadows by providing gaps for plants to germinate in and reducing regrowth of more competitive plant species following hay-cutting. Aftermath grazing will not be an option in most gardens, backyards, and urban spaces. Dominance by more competitive species can instead be prevented by selective cutting and removal, rather than by aftermath grazing.
Germination gaps, otherwise created by trampling of large herbivores, can be created by other forms of soil disturbance (Figure 11.6).

11.1.4 Artificial nest and hibernation sites

There is a wide range of artificial nest and hibernation sites that can be used in gardens and backyards and on buildings. These include various designs of nestboxes for birds, bat boxes, hibernation boxes for West European hedgehogs, *Erinaceus europaeus*, and nest sites for bumblebees and solitary bees and wasps (p.367) (Figure 11.7). Artificial platforms can be erected for nesting white storks. Gravel-topped rooftops in the south-eastern USA can be modified to improve their suitability for nesting least terns. Mesh can be fitting over drains and rainspouts to prevent chicks from falling down them, and a low parapet attached to prevent chicks from falling off the roof and to provide shade from them.

The first consideration when providing artificial nest sites is whether the area is suitable for successful breeding. If unsuitable, then providing the artificial nest site might encourage the species to nest somewhere where it will have lower breeding success than elsewhere, thereby creating an ecological trap. The next decision is where to locate the nest site, to both maximize its suitability for the target species and, where relevant, minimize the risk of predation on it.

There is little information of the effectiveness of providing artificial nesting and hibernation sites in urban areas and gardens and backyards. A study by Gaston *et al.* (2005b) found high occupancy of artificial solitary bee and wasp nest sites in
gardens, but no use of artificial bumblebee nest sites, possibly because they were not positioned in suitable locations.

(p.368)

11.1.5

Minimizing predation on wildlife by domestic cats

Domestic cats kill a large number of birds, amphibians, reptiles, and mammals (Barratt 1997; Woods et al. 2003; Lepczyk et al. 2004). There is, though, little information on the extent to which this affects populations of these species. They may be mainly taking individuals that otherwise succumb to disease or starvation. Irrespective of this, cats can be a real nuisance for people wishing to attract birds and other wildlife to their garden or backyard. Individual cats vary greatly in the numbers of vertebrates they catch. Only a small proportion kill large numbers (Nelson et al. 2005).

Numbers of vertebrates killed by cats in gardens and backyards can be reduced by:

- owners imposing curfews on their cats;
- attaching warning devices to cats’ collars;
- using ultrasonic deterrents to deter cats from entering particular areas.

Fig. 11.7 Artificial solitary bee and wasp nest sites. This artificial nest bank is constructed from a mixture of sand and mud to provide a variety of different substrates for bees and wasps to excavate nest holes in. It also includes cut stems of butterfly-bush, *Buddleja davidii*, inserted into the mud for bees and wasps to nest in. This bank had 19 nests.
Daylight curfews should reduce the numbers of birds killed by cats, particularly during periods when there are large numbers of vulnerable fledglings present. Night-time curfews result in smaller numbers of mammals taken. However, cats subject to nighttime curfews tend to catch greater numbers of reptiles and amphibians overall (Woods et al. 2003). Day- or night-time curfews are unlikely to be acceptable to many cat owners, though. Attaching bells or electronic sonic bleepers to cats’ collars alerts potential prey to their approach. The collars need to be attached using a quick-release mechanism to prevent cats from becoming caught on vegetation. Warning devices consisting of bells or electronic sonic bleepers have both been shown to reduce numbers of animals caught by cats by between a third and a half (Ruxton et al. 2002; Nelson et al. 2005). Electronic sonic bleepers are more expensive than bells, and a high proportion of both are lost when collars fall off. Bleepers also produce a more irritating noise to humans. Attaching bells on quick-release collars is the best option.

Other owners’ cats can be discouraged from your garden or backyard using ultrasonic cat deterrents. These detect the presence of an animal using a motion sensor and then produce a high frequency ultrasonic alarm to scare it away. Experiments have shown these devices to be effective at deterring cats, with this effect appearing to increase with the length of time the device is in operation (Nelson et al. 2006).

Brownfield and mineral-extraction sites
Features of brownfield sites considered important for invertebrate assemblages in temperate areas are:

- a diversity of larval food plants including many ruderal species;
- a diversity and continuity of nectar sources;
- plants stressed by drought, pollutants such as high levels of heavy metals, and mineral deficiency;
- bare and sparsely vegetated ground, especially on friable substrates that invertebrates can burrow in;
- varied vegetation structure;
- a continuity of dead stems, leaves, flower heads, and seeds of open-ground vegetation which is not destroyed by vegetation management.
If an area has been found to support an important invertebrate fauna, then the best way to conserve this is either through non-intervention, while the area continues to support the above-mentioned features, or if not by infrequent patchy disturbance. Motorbike scrambling by local youths is important in helping maintain areas of bare and sparsely vegetated ground at many sites. Although scrub can be an important component of these areas, it often requires patchy removal eventually to prevent it completely dominating.

Key features for important warmth-loving, edge-of-range invertebrates in mineral-extraction sites are similar to those in brownfield sites, but also include:

- vertical or near-vertical exposures for solitary bees and wasps to nest in;
• groundwater-fed seepages, similar to those on soft cliffs (Figure 9.1), and other seasonal pools and damp ground.

If a mineral-extraction site has been found to support an important early successional flora and fauna, then efforts should be made to retain this over at least a proportion of it (Figure 11.8). Little or no further management will usually be required. The value of these features for invertebrates will generally be greater if they face towards the sun. Small areas of open, early-successional habitat can be created on the roofs of buildings. These green roofs have providing suitable breeding habitat for black redstarts, *Phoenicurus ochruros*, northern lapwings, and little ringed plovers, *Charadrius dubius* (Gedge and Kadas 2005). Creation of brownfield habitat on roofs has also been proposed to compensate for invertebrate habitat lost to development (Harvey 2004).