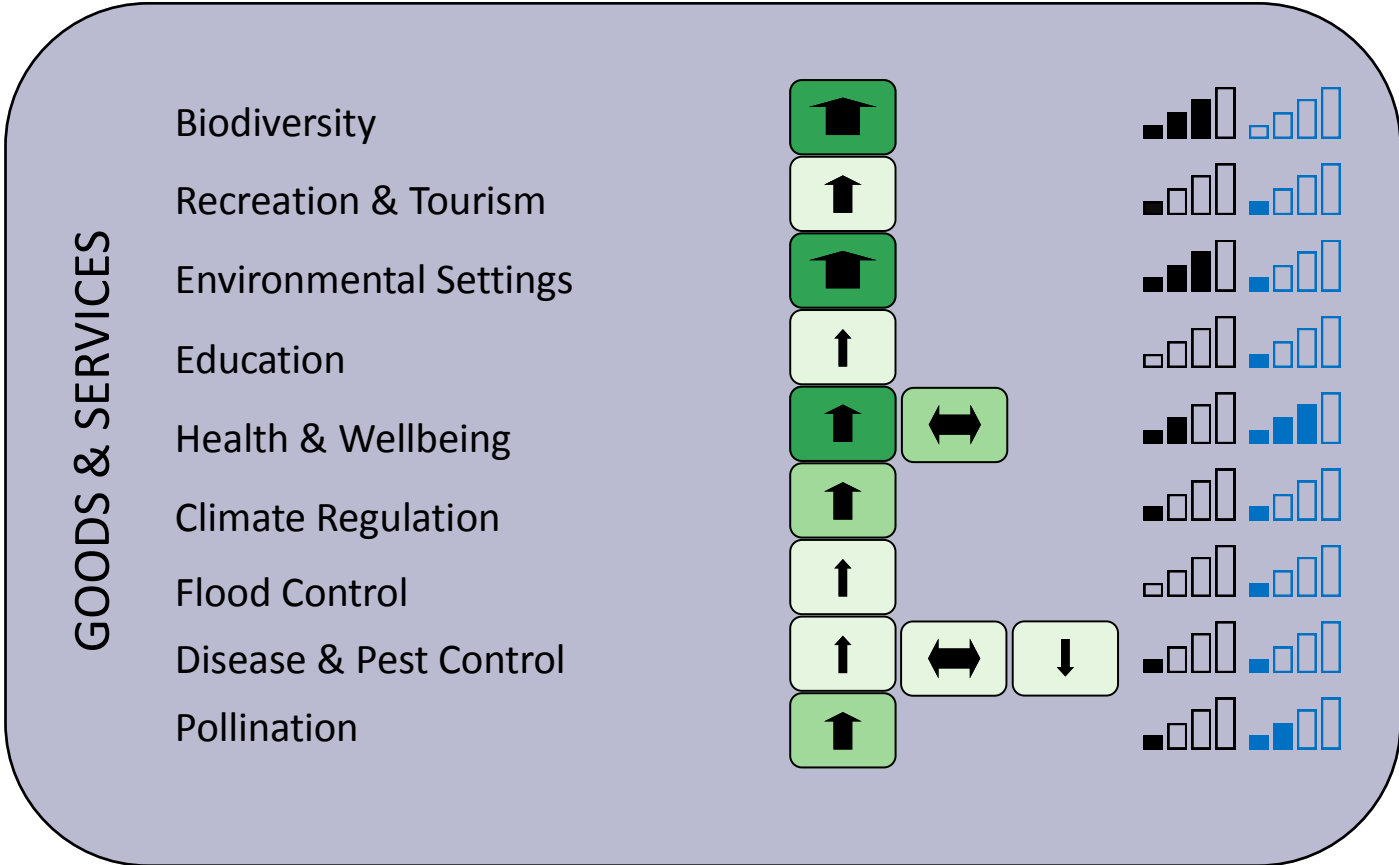


Increase the area of, and access to, urban green areas.

MANAGING ECOSYSTEM SERVICES

URBAN

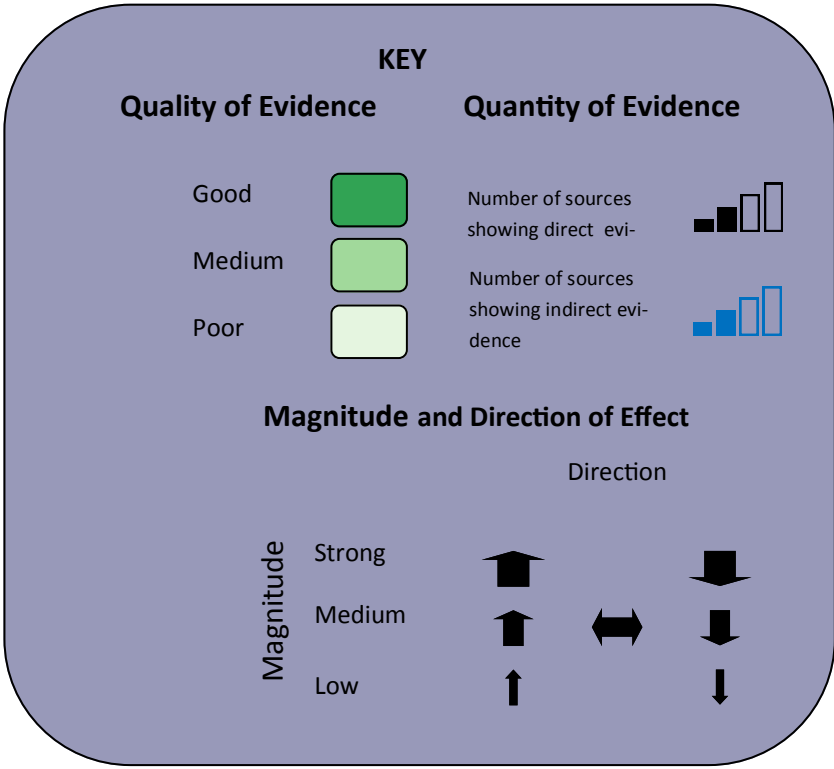
INCREASE GREEN AREAS



These pages represent a review of the available evidence linking management of habitats with the ecosystem services they provide. It is a review of the published peer-reviewed literature and does not include grey literature or expert opinion. There may be significant gaps in the data if no published work within the selection criteria or geographical range exists. These pages do not provide advice, only review the outcome of what has been studied.

Full data are available in electronic form from the [Evidence Spreadsheet](#).

Data are correct to March 2015.



MANAGING ECOSYSTEM SERVICES

URBAN

INCREASE GREEN AREAS

Provisioning Services—providing goods that people can use.

Cultural Services—contributing to health, wellbeing and happiness.

Regulating Services—maintaining a healthy, diverse and functioning environment.

CULTURAL

Biodiversity: Strong Evidence: It is estimated that in the UK, 22.7 million households have access to a garden (87% of homes) with an average garden size of 190m¹ with half providing supplementary food for birds². Gardens also contain 2.5-3.5 million ponds and 28.7 million trees. As such, they represent around 432,000 ha of important habitats, primarily for birds. In Paris, bird abundance was influenced not by area of greenspace, but by its proximity to buildings and building diversity, with a greater variation in building height promoting a greater abundance of omnivorous and tree-nesting species³. Connectivity between green-spaces and gardens is important for maintaining arthropod diversity, with the suggestion that connections need to be maintained between woodland sources and domestic gardens⁴. Even non-managed green-spaces such as urban spontaneous vegetation (USV) can support high levels of biodiversity with regards to plants and invertebrates⁵. A number of studies explore the degree of urbanisation and area or quality of greenspace and bird diversity. In London, site area was found to be the most important influence on bird species richness, while waterbodies and rough grassland also had an effect⁶ with a negative effect due to the presence of buildings. In contrast, buildings in association with greenspaces such as gardens and allotments were found to be important for house sparrows⁷. In the UK, greenspace patch size, structural complexity, species richness of woody vegetation and supplementary feeding were found to influence bird species richness⁸. In Spain, park size and level of human disturbance were found to be the most important predictors of bird species richness, with larger, less disturbed parks having more species^{9,10}. A Swiss study suggests that coniferous trees in urban green-spaces help maximise bird species richness with models predicting 14 species for deciduous trees only and 20 species with a mix of conifers and deciduous trees¹¹. However, Invertebrate diversity on urban trees in England was found to be higher on native species which were primarily deciduous¹². In housing developments, the number of bird species and abundance was found to not be correlated with garden area but was correlated with area of greenspace suggesting that gardens alone are not sufficient for some species¹³. For butterflies, a study from Sweden found that urban greenspace sites could provide almost the same level of species richness as grassland remnants in agricultural settings, but that connectivity between green-spaces was important¹⁴.

Biodiversity: *Strong Evidence*:- In the UK, plant diversity was affected by high levels of non-native species in urban greenspaces and gardens, with 67% of species in gardens being aliens, mostly from Europe and Asia¹⁵, although they do not appear to act as a source for these dispersing into the wider countryside¹⁶.

Recreation and Tourism: *Moderate Evidence*:- Peri-urban land that is used for golf-courses can also have benefits for biodiversity, with 68% of sites having a higher ecological value than green areas used for other purposes¹⁷. Remnant greenspaces are often extensively used for recreation but are also highly valuable for development and so are often under threat¹⁸.

Environmental Settings: *Strong Evidence*:- In Berlin, public-access community gardens (PAC gardens) were found to facilitate broader involvement in the community and allow information exchange, much more so than other uses of greenspace such as allotment gardens¹⁹. Social contacts as part of green space use were investigated in the Netherlands²⁰. Less green space led to feelings of loneliness and social exclusion. Urban nature is found to enrich human nature and is a source of positive feelings²¹. In Montpellier, France, a survey found that 52% of residents would be willing to pay a percentage of their monthly income for green spaces, with wild spaces being preferred over ornamental spaces²². Such greenspaces and trees can encourage the use of outdoor spaces and the exchange of information, as shown by a study in Chicago USA, which demonstrated that green spaces, especially those with trees, attracted more people from a wider demographic range than spaces devoid of nature²³. Neighbourhood satisfaction in Texas was positively correlated with trees, and negatively with commercial land use²⁴. Green space was also found to be important in strengthening sense of community²⁵. Small Public Green Spaces (SPUGS) in Copenhagen were important for socialising and rest, with many people travelling more than 500m to use them²⁶. Higher biodiversity appears to be favoured in greenspaces, with more diversity increasing the psychological benefits²⁷. Green spaces are generally positively regarded with respect to social safety, with more green space meaning great feelings of security unless the environment is very built-up in which case green spaces are regarded with suspicion²⁸. ***Moderate Evidence***:- The amount of social activity associated with a green space appears to be related to the amount of trees and grass, with more barren spaces having less social activity²⁹. Green spaces also affect house prices, with a study from Finland showing that proximity to green space positively influences house prices³⁰.

Education: *Moderate Evidence*:- In Berlin, public-access community gardens (PAC gardens) were found to facilitate environmental education and learning about local sustainability¹⁹. As an example of using urban green space for education about biology, roundabouts in the UK were used to illustrate concepts of island biogeography³¹.

Health & Wellbeing: *Strong Evidence*:- In Sweden, people who lived closer to urban green-spaces were more likely to use them for physical exercise, though very few people lived within 300m of such spaces³² as their distribution was not equitable. A similar pattern was found in Bristol, with adults living close to recreational green spaces more likely to achieve 30 min of moderate activity 5 times a week, and less likely to be overweight or obese³³. A Dutch study found however that while residents of greener areas experienced less stress and more social cohesion, they did not undertake any more exercise³⁴. A UK study found that residents of the greenest areas were more likely to be overweight and obese than those in less green areas, though only over one time period studied³⁵. A similar result was found in Calgary, Canada, where proximity to parks and green space had no influence on childhood obesity³⁶. In the UK, male incidence of mortality from cardio-vascular disease and respiratory disease decreased with increasing green space but no such relationship was found for women³⁷. A similar result was found in New Zealand where there was no established link between cardio-vascular disease and green space³⁸. In the USA's largest cities, no association could be found between mortality from a range of causes and the level of 'greenness'³⁹. For mental health, anxiety and depression was found to be lower in the Netherlands when residents lived close to green space⁴⁰. This effect was especially strong in children and lower socio-economic groups. This finding was not supported by evidence from Sweden that found no correlation between the prevalence of mental health and access to a range of green qualities⁴¹. There appears to be a link between the area of greenspace and the ability to deal with stress, as a study from the Netherlands demonstrates that people were less affected by a stressful life event when there was more greenspace within a 3km radius of their home⁴². Preschool children in Sweden were also less likely to display disruptive behaviours when exposed to play areas with more trees, shrubs and hilly terrain⁴³. There also seems to be a strong link between recovery from mental illness and exposure to green space, with patients in the UK showing more improvement when moved to greener areas⁴⁴.

Climate Regulation: *Strong Evidence*:- An estimated 231,521 tonnes of carbon is stored above ground in the vegetation of Leicester, with 97.3% being associated with trees, the majority of which are on publically owned or managed sites⁴⁵. Another study from the UK found that carbon storage was higher in urban soils than in equivalent agricultural soils, with 17.6 kgm⁻² typically stored in urban soils⁴⁶. For smaller scale climate regulation and heat island effects, small urban green spaces have been shown to reduce temperatures in Lisbon, Portugal⁴⁷, and in Phoenix Arizona, but at the cost of loss of soil water⁴⁸. While local cooling can occur, the effects of cooling on the city-wide scale are less clear⁴⁹, and one study from the USA suggests that reflective buildings have a higher benefit than green spaces⁵⁰. ***Moderate evidence***:- A study from the USA suggests that lack of green space is partly to blame for increases in urban temperatures and so increased energy use from air conditioning. The study suggests that 5-10% of the total energy use in urban areas is used for cooling⁵¹. ***Weak evidence***:- A review of the benefits of gardens suggests that green spaces around houses can regulate temperature and reduce the energy need, though it is not indicated as to whether this is from heating or cooling¹.

Flood Control: *Moderate Evidence*:- A review from the USA suggests that an increase in impermeable surfaces at the expense of green areas can increase storm-water run-off and hence flooding and erosion⁵². ***Weak Evidence***:- The number and diversity of ants decreases with increasing urbanisation, which may affect water infiltration with a knock-on effect on run-off⁵³.

Disease and Pest Control: *Moderate Evidence*:- Parasitoid abundance (as a measure of insect pest control) was found to correlate with flower abundance in urban areas, with more greenspace having a great potential for pest control⁵⁴. Gardens, while having a high number of non-native plant species, do not appear to act as a source of pest species¹⁷. ***Weak Evidence***:- Golf courses close to urban areas may also act as a source of pest-controlling insects as well as pollinators⁵⁵, though there is weak evidence to suggest that domestic gardens may act as a source of non-native plants and pest insects¹.

Pollination: *Strong Evidence*:- Urban greenspace, gardens and allotments are important for maintaining numbers of bumblebees for pollination⁵⁶, with the number of pollinators reducing with increasing urbanisation⁵⁷ and correlating positively with the amount of greenspace⁵⁸ and proximity to gardens⁵⁹. Informal management was found to be better for pollinators in Sweden⁶⁰, but this may not be popular as sites are often regarded as un-tended, though plant diversity and floral abundance is also important⁶¹.

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