

3. Horticulture and Society

3.1 Wellbeing

There is increasing recognition of horticulture's contribution to people's mental and physical health. Spending time in green spaces such as private back gardens, public parks, community gardens and orchards etc. is associated with an increase in people's wellbeing through connection with nature, opportunities for social connection, mindfulness and physical activity.

Physical and Mental Health Benefits:

Physical health:

Spending time outdoors means requires physically moving around, even if just to get there. **Walking is good for physical health**, keeping muscles active, the heart healthier and bones stronger – compared to sedentary activities such as screen based time. Engaging with green spaces, such as **walking through parks** or undertaking **physical gardening** activities improve physical health. Often this happens at times when people might otherwise remain indoors and be less active, such as on weekends or summer evenings. Horticulture is an opportunity to improve physical health outside of work hours.

Improved physical health can reduce people's risk of developing poor health or worsening an existing health condition such as diabetes or heart disease. This is important in the UK where type 2 diabetes and heart disease are associated with sedentary lifestyles, lack of exercise and unhealthy diets.

Exercise is essential for overall health and wellbeing. When a person exercises, such as through walking in a park or gardening, hormones such as dopamine and endorphins are released. These **lower feelings of stress and anxiety, and increase positive feelings such as optimism and confidence**. This connects to the mental health benefits of gardening and green spaces:

Mental health:

An increasing range of studies evidence the **positive impact of green spaces and gardening on mental health**. Spending time outdoors in fresh air, immersed in nature and tending to plants is an escape from day-to-day stresses. **Gardening can act as a mindfulness activity**. By focusing on practical tasks and seeing positive results a sense of satisfaction and fulfilment develops. This **brings about positive feelings, lowers stress levels and improves mood**.

The Mental Health Foundation, a UK charity, published a research report in 2021 called 'Nature. How connecting with nature benefits our mental health' (internet search the name to view the full report). The report found that spending time in green spaces improves people's mental health – for example, 45% of respondents found that visiting green spaces helped them cope during the covid-19 pandemic. Studies like these evidence the importance of **nature therapy, where people improve their wellbeing through spending time in nature**.

Various studies have shown that people who live closer to public green spaces, such as parks, have a lowered risk of heart disease, diabetes, and general stress levels. This is even after adjusted for education, income and employment.

Spending time gardening is a form of nature therapy. This has been engaged with by **mental health charities** such as Thrive, who **offer gardening activities as a way to improve mental health**. **Horticultural therapy can help people recover from traumatic life events**. For example, Horatio's Garden is a charity that operates from within NHS spinal injury centres, creating therapeutic garden spaces that aid people's recover from spinal injury. **Gardens with a horticultural therapy focus usually contain sensory gardens, edible landscapes, contemplation areas, water features and wildlife attracting features**. These can each be used to help in peoples recovery from physical and mental ill health. Mindfulness spaces are important aspects of this. They can use colour theory by selecting cool, harmonious colours such as shades of



Parks offer people the opportunity to spend time outdoors in green space. This is especially important for people who live in flats/apartments without a garden

3.2 Environment

Horticulture brings many benefits to the environment through the provision of ecosystem services. These are discussed in this section and were detailed in topic 2.5 Plant Uses.

Plant Ecosystem Services:

Air quality:

Air pollution occurs as a result of humans burning fossil fuels and undertaking industrial processes that release pollutants and particulates into the atmosphere. It can occur naturally as a result of wildfires, though this is a rare event in the UK. **Air pollution is usually higher in urban areas** where there is a greater volume of traffic on the roads.

The pollutants in air pollution include:

- Gasses, e.g. nitrous oxides released by burning fossil fuels such as diesel. Nitrous oxides are known to irritate the respiratory tract, aggravate asthma and increase risk of respiratory infection.
- Particulate matter (PM) which is categorised into two main groups:
 - PM10, which are particles smaller than 10 micrometres. These can be inhaled into the lungs and may pass into the bloodstream.
 - PM2.5, which are particles smaller than 2.5 micrometres. These can be inhaled into the lungs and more readily pass into the bloodstream, therefore affecting the whole body.
 - Inhaled PM can damage the lungs and increase risk of respiratory health issues. PM that enters the bloodstream can increase risk of ill health, such as heart disease.

Plants are known to reduce air pollution and therefore improve air quality, lowering the health risks associated with air pollution. The RHS have been involved in research that measured plants capacity to capture pollutant particles from the air. Some key conclusions:

- In one week a 1m length of dense hedge can capture the pollution expelled by a 500 mile car journey.
- ***Cotoneaster franchetii* (Franchet's cotoneaster) is 20% more effective at capturing pollution than other shrubs** that were studied. **Its hirsute leaves aid in particulate capture.** Further information can be found by internet searching '*Cotoneaster franchetii* RHS'. The study report can be found here: www.mdpi.com/2076-3298/7/10/81

In locations where air pollution is an issue it is sensible to plant periphery hedges using species that have a dense growth habit, especially alongside roads. Hedges need to be maintained to encourage a dense growth habit, such as regular trimming through the growing season and mulching to improve soil moisture retention, as well as replenishing soil nutrients. It is also recommended to **plant a diverse matrix of plants, including trees, shrubs and herbaceous species within gardens. The more foliage within a garden at a range of heights, the greater the potential for pollution capture.** This will also benefit garden biodiversity by creating a greater range of ecological niches for garden wildlife to occupy. Choosing a Wild Garden style such as a wildlife garden can better create this than Renaissance or Gardenesque styles.

Temperature regulation:

Plants, especially trees, help to reduce high summer temperatures. This is important in urban areas that experience the 'urban heat island' effect. The effect occurs because hard surfaces absorb heat and radiate it back out, including through the night, resulting in higher temperatures than rural areas. **Extreme high temperatures that occur for a longer duration are becoming more likely due to climate change.** This is linked to increased ill health due to heat exposure, including increased occurrence of heat related deaths.

Plants can reduce temperatures due to various factors:

- **Plants shade the ground**, reducing heating of soil and hard surfaces. This means less heat is radiated back into the air, cumulatively



Trees cast shade, cooling spaces below vs. unshaded ground. This is especially important in combatting higher temperatures due to climate change

Fostering soil carbon storage:



Leaves being collected from a herbaceous border. These would be better left to decompose in situ, feeding soil organisms. Resulting humus particles become a carbon store in the soil.

Traditional soil cultivation, such as single or double digging, exposes deeper soil organic matter to high oxygen levels near the soil surface. This increases the rate of its decomposition, including the mineralisation of humus. This means the soil humus content reduces and therefore the soil carbon store does too. The breakdown of organic matter, including humus particles, releases the carbon originally captured by a living plant back into the atmosphere as carbon dioxide. By adopting a no dig approach, the soil carbon store is better able to build up over time. Humus that's washed deeper into the soil where oxygen levels are lower will not be readily mineralised, retaining carbon in the soil. If there's a net addition of organic matter vs. its breakdown in the soil, the soil carbon store will increase.

Many gardens utilise council green waste collection services by filling garden bins with pruned plant material. This removes organic matter from the site, meaning it can't end up in the soil as organic matter. This results in a net loss of soil organic matter from a garden, and therefore soil carbon store, unless the soil is mulched with brought in organic matter.

Composting all pruned plant material within a garden eliminates the potential for net soil carbon loss and will build the soil carbon store. Compost bays can be constructed in larger gardens and the compost produced used as a mulch on garden beds. This isn't practical in smaller gardens. Solutions to this include leaving all pruned material on the soil surface. Cutting it up into smaller pieces, which can be done more quickly using a shredder, will speed the rate at which it is decomposed. Woody material can be sawn into short lengths and used to make log piles, encouraging biodiversity. Aesthetically this is better suited to informal styles such as woodland and wildlife gardens than formal styles.

Composting all material on site also removes the carbon footprint of green waste collection services.

Negative Impacts of Horticulture:

CO₂ Footprint:

The horticultural industry includes many activities that have a high carbon footprint. These activities can be categorised as:

- **Extraction of raw materials.** Habitats are destroyed when raw materials, such as stone for pavers or wood for decking, are extracted. Loss of habitat means plants are no longer there, reducing the sequestration of carbon. Machinery used to extract materials has a high carbon footprint of manufacture and most still uses petrol or diesel as an energy source.
- **Manufacturing of products including packaging.** The production of products such as fertiliser, plant containers, tools and equipment, etc. uses a lot of energy which is largely derived from burning fossil fuels.
- **Transport of materials.** Vehicles transporting plants and other horticultural products largely run on petrol or diesel. As these fuels are burnt in the vehicle's engine, carbon dioxide is released as a waste gas. This contributes to global warming, which causes climate change.
- **Operation of garden machinery using fossil fuels.** As with transport, running non-electric machinery uses oil-derived fuels such as petrol for mowers, two-stroke strimmers or hedge cutters, or diesel for tractors. Electric powered alternatives are increasingly available. Depending on the source of electricity these can have a lower carbon footprint, for example if the electricity is generated from renewable sources. Battery powered machinery is increasingly available, though the extraction of raw materials for batteries, as well as their manufacture and transport, has a considerable carbon footprint.



Manufacture, transport and packaging of materials has a carbon footprint. Packing materials such as polystyrene are oil-derived and cannot be recycled, meaning it will end up in landfill or incinerated.

Implications of climate change on horticultural green spaces:

In the UK, the climate is expected to alter in two significant ways:

- **The cooler season** (autumn, winter and spring) **is expected to become windier with heavier rainfall events. Mild temperatures are likely to become even more common in winter**, though sporadic cold spells will continue to bring freezing temperatures.
 - This can lead to wind damage to plants, fences and buildings.
 - High rainfall can increase flood risk, soil erosion and risk of root rot in waterlogged winter soil.
 - Pollinators, especially bumblebees, may increasingly fly during winter when temperatures are mild. Without nectar provision they can starve, negatively impacting their population.



Fields in August 2022 following prolonged dry weather. This is more likely to occur due to climate change.

- **Summer is expected to experience prolonged hotter temperatures and increased durations without significant rainfall, leading to more prolonged droughts.**

- This increases heat stress on plants, especially combined with dry soil, leading to a decline in plant health.
- Unshaded outdoor spaces can become less usable in very hot weather, reducing recreational and relaxation potential of green spaces. This will negatively impact mental and physical health.

Gardens and other horticultural green spaces need to adapt. A range of potential strategies are outlined below:

- **Not all plants will remain suitable in their current positions and will suffer a decline in health. These will need to be moved to a more suitable location or replaced with species better suited to the changing climate.**
 - For example, growing climbing roses against the south facing walls. With increased heat, often associated with dry soil conditions, climbing roses will suffer heat and drought related stress, increasing susceptibility to pests and pathogens, as well as reduced repeat flowering. This reduces their ornamental value. They would be better moved to a cooler, damper location and replaced with a heat tolerant climber such as *Campsis radicans* (trumpet vine) or *Passiflora caerulea* (blue passion flower).
- **Garden design choices will need to change, for example locating seating areas where they're shaded from afternoon sun during the heat of the day.** Hard surfaces exposed to sunshine absorb and radiate more heat than shaded areas, increasing temperatures in hot weather. This can make gardens less usable.
- **Impermeable hard surfaces should be avoided**, with preference given to minimising the area of hard surfaces and only using porous surface materials. This reduces potential runoff during intense rain events, reducing the risk of flooding.
- **If soil structure is improved**, for example by mulching with organic matter and allowing soil organisms to increase soil organic matter content, **the rate of water infiltration can increase. This will help to mitigate storm runoff** as the soil has a higher capacity to absorb water. As well as **reducing flood risk**, it will also reduce potential soil erosion due to runoff.
- **Reducing lawn area to create garden beds will also increase water absorption capacity of a garden.** Lawns typically have a level of compaction due to footfall and are less effective at rapidly absorbing rainfall.



Garden relaxation areas are increasingly better sited in afternoon shade to make them more usable during hot weather.

3.4 Community

Community horticulture brings people together with the purpose of improving their lives through gardening. The various settings in which community horticulture projects occur are detailed in this section.

All community horticulture has the same general positive outcomes for those directly involved and for the local community.

Benefits of Community Horticulture:

- **Fostering community cohesion** by connecting people from different cultures within the local population.
- **Helping new residents make connections** and gain a sense of belonging.
- **Building pride in the local area** by caring for the land.
- **Improvement in mental health** through nature-based activities and social connection.
- **Improvement in physical health** through gardening activities.
- **Gaining new knowledge and practical skills.**
- **Connecting to nature by spending time outdoors in a garden setting.** This is especially important for local residents who don't have a garden.
- Potentially **the opportunity to take home fruit and vegetables, improving nutrition.**

School and Community Projects:

School horticulture projects include school gardening clubs and may include formal horticulture qualifications for older children, such as level 1 or level 2 horticulture.

These offer children the opportunity to learn how plants grow, fostering a lifetime appreciation of plants and gardens. Learning opportunities come from discovering the importance of light, water, nutrients and warmth to plant growth. **Plants can be used to teach children about biodiversity and ecosystems, the importance of pollinators and protecting the environment. Growing edible crops offers important lessons in understanding where food comes from and how to eat a healthy, balanced diet.** This early exposure to horticulture can inspire young people to pursue a horticultural career.

Organisations help schools develop horticulture projects, including the RHS Campaign for School Gardening. Visit the website: schoolgardening.rhs.org.uk to discover the ways that the RHS supports schools, including provision of activity and 'how to' guides, training courses for school staff, and even an award structure to encourage school gardening clubs to develop and attain higher levels.



A raised bed being planted in a school garden by the gardening club.

Community horticulture projects have been largely detailed in topic 2.6 Edible Landscapes. They **include community gardens, community orchards, organised guerilla gardening**, and other green space projects. Their benefits were also discussed in topic 2.6 and are detailed further in the section 'Public Greenspace and Communities', below.

Britain in Bloom:

This is a **competition run by the RHS that encourages community gardening groups to enhance their local green spaces.** Groups that enter the annual competition have the opportunity to win formal recognition for their achievements. They also gain the opportunity to connect with other community gardeners, get advice from RHS experts and access to seed giveaways.

Detailed information can be found by internet searching 'RHS Britain in Bloom' and accessing the RHS website pages dedicated to the competition (note that at level 2, only the brief overview of the competition, as outlined above, is required).